SHOUT
SHARE
IT

THE ROYAL CANADIAN INSTITUTE

8-5-

BULLETIN

OF THE

Harvard University.

MUSEUM OF COMPARATIVE ZOÖLOGY

AT

HARVARD COLLEGE, IN CAMBRIDGE.

VOL. LXIII.

UNIVERSITY OF TORONTO LIBRARY

CAMBRIDGE, MASS., U. S. A.
1919–1920.

QL
1
H3
V.63

613364
4.7.55

CONTENTS.

Page

No. 1.— A SECTION IN THE TRENTON LIMESTONE AT MARTINSBURG, NEW YORK. By Thomas H. Clark. (1 plate). May, 1919 . . . 1

No. 2.— SOME CRITICAL NOTES ON BIRDS. By Outram Bangs and Thomas E. Penard. June, 1919 19

No. 3.— THE ANTS OF BORNEO. By William Morton Wheeler. July, 1919 41

No. 4.— REPORTS ON THE SCIENTIFIC RESULTS OF THE EXPEDITION TO THE TROPICAL PACIFIC IN CHARGE OF ALEXANDER AGASSIZ, ON THE U. S. FISH COMMISSION STEAMER "ALBATROSS," FROM AUGUST, 1899, TO MARCH, 1900, COMMANDER JEFFERSON F. MOSER, U. S. N., COMMANDING. XXI. THE BIRDS. By Charles Haskins Townsend and Alexander Wetmore. August, 1919 149

No. 5.— THE PSAMMOCHARIDAE OF WESTERN NORTH AMERICA. By Nathan Banks. September, 1919 227

No. 6.— PACIFIC COAST POLYCHAETA COLLECTED BY ALEXANDER AGASSIZ. By Ralph V. Chamberlin. (3 plates). November, 1919 249

No. 7.— THE ANTS OF THE BRITISH SOLOMON ISLANDS. By William M. Mann. (2 plates). December, 1919 271

No. 8.— SOME AMPHIBIANS FROM NORTHWESTERN PERU, WITH A REVISION OF THE GENERA PHYLLOBATES AND TELMATOBIUS. By Thomas Barbour and G. K. Noble. (3 plates). January, 1920 393

No. 9.— DOGS OF THE AMERICAN ABORIGINES. By Glover M. Allen. (12 plates). March, 1920 429

Bulletin of the Museum of Comparative Zoölogy
AT HARVARD COLLEGE.
Vol. LXIII. No. 1.

A SECTION IN THE TRENTON LIMESTONE AT MARTINSBURG, NEW YORK.

By Thomas H. Clark.

With One Plate.

CAMBRIDGE, MASS., U. S. A.:
PRINTED FOR THE MUSEUM.
May, 1919.

Digitized by the Internet Archive
in 2010 with funding from
University of Toronto

http://www.archive.org/details/bulletinofmuseu63harv

No. 1.— *A Section in the Trenton Limestone at Martinsburg, New York.*

By Thomas H. Clark.

Martinsburg is a small town situated in Lewis Co., N. Y., west of the Adirondacks and east of Lake Ontario. It lies just within the northwestern corner of the "Port Leyden quadrangle," the geology of which has been described by Prof. W. J. Miller (N. Y. state mus. Bull. 1910, 135). The village is situated upon the upper of two prominent terraces facing the Black River, and at an elevation of about 500 feet above it. The contact of the Pre-Cambrian gneiss with the sediments is along the western margin of the alluvial plain of the Black River, and the terraces are underlain by Ordovician limestone which dips gently westward.

The summit floor of the terrace upon which Martinsburg stands varies in width from one to two miles, and between it and the level land along the Black River is a steep slope broken by a narrow but pronounced shelf developed on the surface of the Black River limestone. In this slope Roaring Brook has cut a deep trench, which affords a fresh and almost continuous section of the Ordovician limestone. The exposures along this brook make up the greater part of the section here described, but as the rocks are largely concealed along its upper stretches, outcrops along the road and old quarries near the village of Martinsburg were also studied.

In the Bulletin mentioned above, Miller has given a detailed section of the strata below the Trenton, but concerning that formation he gives no information beyond the estimate of 475 feet for the total thickness.

Dr. Raymond visited this section in 1912, and has called attention (Summary report Director Geol. survey, Department of mines, Canada, for 1912, 1914, p. 345) to its importance in the correlation of the Trenton of the typical section at Trenton Falls, N. Y., with the supposedly equivalent deposits in Ontario. His work indicated the desirability of more detailed study of the section, and at his request I spent two weeks in the area in 1916, and visited it again for a short time in 1917.

THE SECTION.

For convenience, the beds of the section will be described in ascending order.

The hard cherty Black River limestone has resisted erosion more successfully than the rather thinly bedded Trenton limestone above it, so that a platform a quarter of a mile wide has been excavated upon its surface. Since the surface of this platform, even in the stream bed, is more or less masked by debris from the bluff behind it, the exact contact with the Trenton is seldom seen. Fortunately, however, I found on my second visit that the spring freshets of 1917 had removed a part of the covering of detritus in the stream bed, so that the basal twelve inches of the Trenton was clearly shown. This proved to be a dark blue, fine grained dense limestone, mostly without fossils, but with here and there a thin band of small specimens. This bed was without shaly partings to divide it into subordinate layers, and showed no trace of clastic matter, so there was no evidence of a "basal conglomerate." It differed from the underlying Black River limestone in being finer grained with a more flinty fracture, and in lacking the chert. The few fossils obtained from it are species characteristic of the Trenton, *Triplecia extans* being the most important.

Above this basal layer there would seem to be about five feet of strata concealed, the next outcrop being in the bank of the stream about halfway across the shelf. At this locality a few thick beds of highly fossiliferous dark blue impure limestone are exposed, with rather thick bands of shale between the beds of limestone. The following were the most common fossils, the first three being particularly diagnostic, and, in this section, apparently confined to the lower ten feet of the Trenton: —

Triplecia extans (Emmons), *T. cuspidata* (Hall), *T. schucherti*, sp. nov., *Parastrophia hemiplicata* Hall, *Rafinesquina alternata* (Emmons), *Subulites elongata* Conrad, *Hormotoma trentonensis* Ulrich & Scofield, *H. bellicincta* (Hall), *Streptelasma corniculum* Hall.

The last species was particularly abundant; one slab, about thirty-six square inches in area, containing about forty specimens on its surface. From the partings between the beds of limestone, large numbers of complete specimens of Triplecia, retaining both valves, were obtained.

Above the fossiliferous basal beds there are about 280 feet of dark limestone in beds two inches to a foot in thickness, separated by partings of shale which become more numerous and thicker in the upper part of this division, but which seldom contain any great number of fossils. Some of the beds of limestone are composed of fine grained material, while others contain a certain amount of more coarsely crystalline calcite. In the latter case the crystallization affects only the matrix, and does not obscure the fossils. Some of the layers are made up almost entirely of fragments of shells, a sort of coquina, while others are nearly or quite devoid of fossils.

The peculiarities of the distribution of fossils in these strata are as follows: —

At seventy feet above the base of the Trenton there is a layer, exposed on the road from Martinsburg to East Martinsburg, which contains great numbers of *Sinuites cancellatus* (Hall).

One hundred feet above the base there is a layer containing, among other fossils, *Dalmanella rogata* (Sardeson), *Isotelus gigas* DeKay, *Calymene senaria* Conrad, *Cryptolithus tessellatus* Green.

This layer is found near the base of the upper of the three falls which have been developed by Roaring Brook in the lower part of the Trenton, and five feet above the broad flat platform which extends from the top of the middle fall to the base of the upper one. The layer containing Cryptolithus is only a few inches thick, and is a fairly pure, nearly black limestone. Cryptolithus is quite abundant and its discovery here is of considerable interest as it has not previously been reported in the Trenton north of Trenton Falls in the region west of the Adirondacks.

In the strata 100 feet above the base Platystrophia first becomes abundant, and the fifteen feet above the 165 foot level contain especially well-preserved specimens. Associated with the Platystrophias are the other common fossils of the Trenton, such as *Calymene senaria, Dalmanella rogata, Plectambonites sericeus,* etc.

Between the 200 and 300 foot levels the limestone is composed of little else than fragments of shells, and at 280 feet is the lowest layer of coarsely crystalline limestone. Large specimens of an undescribed *Dalmanella* are found in this stratum, and as usual, only the matrix and not the fossils is affected by the crystallization. At 290 feet there is a layer showing the so-called "giant ripple mark," the crests being several feet apart, and their direction about N. 45° E. The rock is composed of columnals of crinoids and fragments of brachiopods. In the hundred feet of beds just described there are no very remarkable fossils, but it is the zone of the greatest development of *Prasopora simulatrix,* which is there very common indeed.

Between 300 and 390 feet above the base the rocks are a rather coarsely crystalline limestone which is neither very well exposed nor, apparently, very fossiliferous. In the basal layer I found a Carneyella, the first representative of the Agelacrinitidae to be reported from the Trenton of New York; and this layer is also the lowest bed in which *Rafinesquina deltoidea* is found.

The remaining eighty-five feet of the Trenton, (390–475 ft.) is a dark, thickly bedded, impure limestone with little shale, which on weathering breaks down into a rubbly mass. Fossils are rather common in places, but only on weathered surfaces. *Strophomena trilobata, Rafinesquina camerata*, and *R. deltoidea* are the most common and characteristic fossils, while *Hormotoma trentonensis, Trochonema umbilicatum*, and *Streptelasma corniculum* are other abundant species, these latter forms being "recurrent" from the lower twenty feet of the formation.

The accompanying table shows the species found, and their vertical distribution.

	Base	5	15	20–30	70	100	165–180	210	245	270–280	290	300	390	400	410	420	440	**Upper Trenton**
PLANTAE																		
Buthotrepis caespitosa Hall	...	...	...	...	...	...	...	...	...	...	×	...	...	...	...	...	...	...
ANTHOZOA																		
Streptelasma corniculum Hall	...	×	...	...	...	...	...	...	...	...	...	...	×	×	×	...	×	...
ECHINODERMATA																		
Cheirocrinus anatiformis Hall	...		...	...	...	×	...	...	...	...	...	...	×	...	×	...	...	...
Carneyella raymondi Clark	...	...	...	...	...	...	...	...	...	...	...	×	...	...	...	...	...	...
BRYOZOA																		
Prasopora simulatrix var. occidentalis Ulrich	...	×	...	×	×	×	×	...	×	×	...	...	...	...	...	...	...	...
Escharopora confluens Ulrich	...	×	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Rhindictya neglecta Ulrich	...	×	...	×	...	...	...	...	...	...	...	...	...	...	...	...	...	...
OSTRACODA																		
Leperditia sp. ind.		×	...	×	...	...	×	...	...	...	...	...	...	...	...	×	...	...
TRILOBITA																		
Cryptolithus tessellatus Green	...	...	...	...	...	×	...	...	...	...	...	...	...	...	...	...	...	...
Isotelus gigas DeKay	...	...	×	×	...	×	×	...	...	...	...	...	×	...	×	×	...	×
Illaenus americanus Billings	...	...	...	...	...	...	...	...	...	...	...	...	...	...	×	...	...	...
Calymene senaria Conrad	...	×	...	×	×	×	×	...	...	×	...	...	...	...	...	...	...	...
Ceraurus pleurexanthemus Green		×	...	...	...	...	×	...	...	...	...	...	...	...	×	...	...	...
BRACHIOPODA																		
Pseudolingula rectilateralis (Emmons)		×	...	...	...	×	×	...	...	...	...	...	...	...	...	...	...	×

	Base	5	15	20–30	70	100	165–180	210	245	270–280	290	300	390	400	410	420	440	Upper Trenton
Trematis terminalis (Emmons)	...	...	...	...	...	...	×	...	...	×	...	...	...	...	...	...	...	...
Schizocrania filosa Hall	...	...	×	...	×	×	...	...	...	...	...	×	...	...	...	...	...	...
Plectorthis sp.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	×
Platystrophia sp. nov.	...	...	×	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
"biforata"	...	...	...	...	...	?	×	...	...	×	...	×	×	×	×	×	...	...
colbyensis Foerste	...	...	...	...	...	...	...	×	...	...	...	...	...	...	...	...	...	...
Dalmanella rogata (Sardeson)	...	×	×	×	...	×	×	...	...	×	...	×	...	...	×	×	...	×
sp. nov.	...	...	...	...	...	...	...	...	...	×	...	...	...	...	...	...	...	...
Dinorthis pectinella (Emmons)	...	×	...	×	...	...	...	...	...	×	...	×	...	...	...	×	...	...
Plectambonites sericeus (Sowerby)	...	×	×	×	...	×	...	...	...	×	...	×	×	×	×	×	...	×
Rafinesquina alternata (Emmons)	...	×	×	×	...	...	×	...	×	...	...	×	...	×	...	×	×	×
deltoidea (Conrad)	...	...	...	...	...	...	...	...	...	...	...	×	...	...	...	×	?	×
camerata (Conrad)	...	...	...	...	...	...	...	...	...	...	...	...	×	...	×	...	×	×
minnesotensis (N. H. Winchell)	...	...	...	×	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Strophomena filitexta Hall	...	...	...	×	...	...	...	...	...	...	...	...	...	...	...	...	...	...
trilobata (Owen)	...	...	...	...	...	...	...	...	...	...	...	...	×	×	×	×	...	×
Triplecia cuspidata (Hall)	...	×	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
extans (Emmons)	×	×	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
schucherti Clark	...	×	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Parastrophia hemiplicata Hall	...	×	...	×	...	...	...	...	...	×	...	...	...	×	...	...	...	...
rotunda (Winchell & Schuchert)	...	×	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Rhynchotrema increbescens (Hall)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	×	...
Zygospira recurvirostris (Hall)	...	...	...	...	...	×	×	...	...	×	...	...	×	...	...	...	...	...
GASTROPODA																		
Sinuites cancellatus (Hall)	...	...	×	×	×	...	...	...	...	...	...	...	×	...	×	...	...	...
Sinuites cancellatus v. corrugatus (Hall)	...	...	...	...	×	...	...	...	...	...	...	...	...	...	...	...	...	...
Phragmolites compressus Con.	×	×	×	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tetranota bidorsata (Hall)	...	×	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pleurotomaria (Trochonema?) ambigua Hall	...	...	...	...	×	...	...	...	...	...	...	...	...	...	×	...	...	...
Lophospira serrulata (Salter)	...	×	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hormotoma trentonensis Ulrich & Scofield	...	×	...	...	×	...	...	...	...	×	...	×	×	...	×	...	×	...

	Base	5	15	20–30	70	100	165–180	210	245	270–280	290	300	390	400	410	420	440	Upper Trenton
Hormotoma bellicincta (Hall)	...	×			...	...	...	...	...	...	...	...	...	...	...	...	...	...
gracilis (Hall)	...	...	?	...	...	...	...	...	×	...	...	...	?	...	...	...	...	...
Liospira americana (Billings)	...	...	×	...	...	...	...	...	...	...	...	...	×	...	×	...	×	×
Raphistoma rotuloides (Hall)	...	×	..	×	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Trochonema umbilicatum (Hall)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	×	...	×	...
Gyronema percarinatum (Hall)	...	×	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Holopea obliqua Hall	...	×		...	...	...	...	...	...	...	...	...	×	...	...	...	...	...
Subulites elongatus Conrad	...	×	×	...	...	...	...	...	...	...	...	...	×	...	...	...	...	×
PELECYPODA																		
Ctenodonta nasuta (Hall)	...	...	...	...	...	...	...	...	...	...	...	×	...	...	...	...	...	...
levata (Hall)	...	...	...	...	×	...	...	...	...	...	...	...	...	...	...	...	...	...
Whitella subtruncata (Hall)	...	...	...	×	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ambonychia amygdalina Hall	...	...	×	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

CORRELATION

Obviously this section should first be compared with that at Trenton Falls, which is about sixty miles south of Martinsburg. Comparing it with the composite Trenton Falls–Rathbone Brook section, published by Raymond, (Bull. M. C. Z., 1916, **56**, p. 253), it appears that the Trenton at Martinsburg is 129 feet thicker than at Trenton Falls. The discovery of Cryptolithus at Martinsburg gives a much better basis for comparison of the two sections than was previously to be had. In the typical section, the highest layer with Cryptolithus is seventy-three feet above the base, while at Martinsburg it is 100 feet above. At Trenton Falls, *Rafinesquina deltoidea* appears 228 feet above the base of the Trenton; at Martinsburg the lowest layer containing this species is 300 feet above the base. In both sections the strata between those characterized by these "guide fossils" are layers of thinly bedded dark limestone alternating with beds of shale one or two inches in thickness, the fauna in both cases being composed of large numbers of the more common Trenton fossils, particularly *Prasopora simulatrix*, Dalmanella, Plectambonites, Platystrophia, Calymene, Ceraurus, and Isotelus. The similarity of the strata and the occurrence of these three zones in the same order are, I believe, sufficient to indicate the correctness of the correlation of the portions of the sections occupied by these faunas, even though the zones of the two localities are not of the same thickness. The lower 390 feet of the section at Martinsburg are therefore probably the equivalent of the total 346 feet of the combined Trenton Falls–Rathbone Brook section, and the upper eighty-five feet of the section at Martinsburg have no equivalent in the limestone of the more southern section, but form a younger deposit. This is the view already advanced by Raymond, but supported by less evidence.

While the general correlation between these two sections is obvious, detailed correlation is attended with difficulties, and probably should not be attempted until the intervening region can be studied. While *Cryptolithus tessellatus* occupies a zone about forty feet thick in which it is abundant over a stretch of more than a thousand miles from east of Quebec down past Montreal, the Champlain Valley, Saratoga, and the Mohawk Valley to Rathbone Brook, at Martinsburg it is found in only a single layer, and that twenty to thirty feet higher in the section than it is normally found. Its western migration was evidently delayed, and finally stopped by something other than a physical barrier, but just what it was is not evident. At Martinsburg the lowest beds are characterized especially by three species of Triplecia. At Trenton Falls one of these species, *T. extans,* is quite common in one layer, but that layer is about seventy-five feet above the base, and above the range of Cryptolithus, and not below it. The meaning of this interchange of position is likewise not yet understood.

The occurrence of Triplecia in the lowest zone at Martinsburg is of value in making a correlation with the Trenton of Ontario. In the section at Ottawa and vicinity (Raymond, Guide book 3, Excurs. 12th Internat. geol. cong. 1913) one finds at the base thirty-five feet of limestone with *T. extans, Phragmolites compressus,* and other fossils; in the middle a thick zone with numerous fossils including an abundance of *Prasopora simulatrix.* Then come two zones characterized by *Rafinesquina deltoidea* and *Strophomena trilobata* respectively, the general sequence being that at Martinsburg but with a different development of the zone between that of Triplecia and that of Prasopora.

These notes should suffice to show the great importance of the Martinsburg section, since by combining in itself elements of the faunas of the Trenton to the north and the Trenton to the south, it permits a correlation which has formerly been in doubt. Perhaps the most significant feature is the demonstration of the fact that the strata at Martinsburg, containing the fauna with *Strophomena trilobata*, gastropods, and Streptelasma, the so-called "Fusispira beds," are younger than any of the limestone in the section at Trenton Falls. This has a far-reaching effect, for the Fusispira beds extend across Ontario and appear as the upper part of the Prosser limestone in Minnesota, Wisconsin, and Iowa.

DESCRIPTION OF NEW OR INTERESTING SPECIES.[1]

COELENTERATA.

STREPTELASMA CORNICULUM Hall.

Streptoplasma corniculum Hall, Pal. N. Y., 1847, **1**, p. 69, pl. 25, fig. 1a–1e.

This species is one of the commonest in the lowest beds, but does not appear again until horizon 390 is reached. Here, and again at 400, 410, and 440 feet above the base it is fairly abundant. Although the specimens from the upper part of the Trenton are generally larger than those from the basal beds, I cannot determine any specific difference between them. By making transverse and longitudinal sections of large individuals I satisfied myself that these show in their younger stages the characteristics of Hall's species (now abandoned) *S. parvula*. The specimens from the upper part of the Trenton are well preserved, while those from the basal beds are for the most part badly crushed. It was in these beds that I found this species in such great abundance. One slab of rotten shale, about one quarter of a square foot in area had on its surface no fewer than forty specimens.

ECHINODERMATA.

CHEIROCRINUS ANATIFORMIS (Hall).

Plate **1**, fig. 17.

Echino-encrinites anatiformis Hall, Pal. N. Y. 1847, **1**, p. 89, 318, pl. 29, fig. 4a–4f.

The discovery of a few specimens of this rare species is of interest, since the exact horizon of the fossil has not previously been known. Hall stated that his specimens were from the "midst of the fossiliferous portion of the Trenton limestone" at Turin, Lewis Co., N. Y. I found a single plate, not absolutely identifiable, in the zone with Cryptolithus, 100 feet above the base of the section, but better and readily recognizable specimens were found in the Upper Trenton, from 390 to 410 feet above the base. It seems probable that this is the true horizon of the species. A species of Cheirocrinus, named *C. walcotti* by Jaekel (Stammesgsch. Pelmat., 1899, p. 221, pl. 11, fig. 8) is very common in certain layers low in the upper third of the Trenton at Trenton Falls and, therefore, at a somewhat lower horizon than the Cheirocrinus at Martinsburg. The name was proposed by Jaekel largely because *C. anatiformis* was so poorly described as to be almost unrecognizable, and a comparison of specimens shows that there is very little if any difference between the two species. The specimens from Martinsburg show the numerous pectinirhombs which were ignored by Hall in both illustration and description, and one which retains the plates of the upper part of the calyx shows a series of small plates covering the ventral grooves. That Jaekel was right in referring this species to Cheirocrinus instead of Echinoencrinites is obvious.

---

[1] Bull. 92, U. S. N. M. contains an extensive bibliography of the various species here discussed.

CARNEYELLA RAYMONDI, sp. nov.

Plate 1, fig. 18, 19.

Specimen small, nearly circular in outline, with a peripheral ring one fourth of the diameter in width. There are six rays, five of which are straight, but ray II is bifurcated about one third the distance from the center to the peripheral ring, and the anterior branch curved in a contrasolar direction. The supraoral plates are damaged, and only three cañ be seen, but these are large, fully three times as large as the lateral covering plates. Their outlines are mostly obliterated. The interradii are covered with relatively large imbricating plates, but unfortunately the anal interradius is so poorly preserved as to obscure the anal pyramid. None of the rays shows any trace of auxiliary covering plates. The type (M. C. Z. 3,978) and only known specimen is 8 mm. in diameter. It was found by the writer, attached to a shell of *Rafinesquina alternata*, in a layer 300 feet above the base of the Trenton in the gorge of Roaring Brook, near Martinsburg, N. Y. The horizon is at the base of the *Rafinesquina deltoidea* zone. So far as is known, this is the first agelacrinitid to be found in the Ordovician rocks of New York State.

The most closely allied species is probably *C. multibrachiatus* (Raymond).[1] The type of that species has eight rays, though Dr. Raymond suggests that the normal number may prove to be seven. In the Canadian species, however, the periphery is still broader than in *C. raymondi*, the width being equal to one third of the diameter.

BRYOZOA.

PRASOPORA SIMULATRIX VAR. OCCIDENTALIS Ulrich.

Prasopora simulatrix var. *occidentalis* Ulrich, Pal. Minn., 1893, **3**, p. 246, pl. 16, fig. 1, 2, 6, 7.

This species, and possibly others of like form, is extremely abundant from 160 to 280 feet above the base of the Trenton. It also occurs practically throughout the lower part of the Trenton. I do not wish to give the impression that all the hemispheric Bryozoa collected at Martinsburg belong to this species. Such is probably not the case. But from the scores of specimens collected, I examined sections of six taken at random. All of these proved to be *Prasopora simulatrix* var. *occidentalis*. While other genera may be represented in the many unexamined forms, the probability is that few, if any, do not belong to Prasopora.

ESCHAROPORA CONFLUENS Ulrich.

Escharopora confluens Ulrich, Pal. Minn., 1893, **3**, p. 171, pl. 13, fig. 1–11.

I found this bryozoan very abundant in the basal beds. It occurs mostly as inch-long fragments not showing the mode of growth, but by removing a large slab of limestone from the bed of the creek, I uncovered some large branching specimens embedded in the soft shaly parting. One specimen was found to branch three times in a length of two inches.

BRACHIOPODA.

PSEUDOLINGULA RECTILATERALIS (Emmons).

Lingula rectilateralis Emmons, Geol. N. Y. Rept. 2d dist., 1842, p. 399, fig. 6.

This species occurred in Upper, Middle, and Lower Trenton. At horizon 180 I found a specimen protruding downwards from an overhanging stratum of limestone, the anterior margin being embedded in the matrix, and the posterior margin free below the rock. This was probably the position in which the animal lived, besides being the position in which it died, standing erect in the mud, as do the Lingulae to-day.

---

[1] Ottawa naturalist, **24**, p. 60, pl. 1, fig. 2.

PLECTORTHIS sp.

In the Upper Trenton, near the state road, I found one specimen of Plectorthis, but, although it is in an excellent state of preservation and almost complete, it could not be identified with any described species. In a genus usually so common, I hesitate to make a new species from a single specimen.

RAFINESQUINA MINNESOTENSIS (Winchell).

Strophomena minnesotensis Winchell, Ninth ann. rept. Geol. nat. hist. survey Minn., 1881, p. 120.

This species is rather frequently listed of late, usually from formations of Black River or Stones River age. The horizon of the original specimens was, however, Lower Trenton, and it is gratifying that its first record from New York should be at that horizon. The fossil is very difficult to identify unless one has the interior of the brachial valve. Such a specimen was found, showing the large muscular area, the divergent ridges, and the shallow depression circumscribing the scars. It is also thickly dotted with "ovarian" markings.

STROPHOMENA TRENTONENSIS Winchell & Schuchert.

Strophomena trentonensis Winchell & Schuchert, Pal. Minn., 1893, **3**, pt. 2, p. 389, pl. 30, fig. 41.

While this species has a wide distribution, specimens are seldom found. A pedicle valve obtained fifty feet above the base of the Trenton has the muscle scars somewhat smaller than in the Minnesotan type, and the two divergent ridges which should appear beside the median elevation in the muscular area are lacking. In spite of these variations, the smooth interior of the pedicle valve leaves little doubt of the correctness of the identification.

TRIPLECIA CUSPIDATA (Hall).

Plate 1, fig. 1–6.

Atrypa cuspidata Hall, Pal. N. Y., 1847, **1**, p. 138, 318, pl. 33* (supplementary plate), fig. 1a–h: Hall & Clarke, Pal. N. Y., 1892, **8**, pt. 1, p. 270.
Triplecia extans Hall & Clarke, Loc. cit, 1892, pl. 11c, fig. 1–3.

Without exception, *Triplecia cuspidata* is the most abundant fossil in the basal ten feet of the Trenton at Martinsburg, and a large number of complete specimens retaining both valves were collected. Most are large, specimens 18 mm. long and 25 mm. wide being common. Smaller specimens are also present in some numbers, but not the very young. Two specimens, one 9 mm. by 11 mm., another 20 mm. by 28 mm., probably represent the extremes of the range in size. The smaller of these is 6 mm. thick, the larger 17 mm. It proves in practice somewhat difficult to separate the various species of Triplecia. It will be remembered that Hall, at the end of his first work on Trenton fossils, came to the conclusion that *Atrypa extans* and *Atrypa cuspidata* were identical. *Triplecia nuclea* is easily recognized by its small size, sharp, narrow fold and sinus, and absence of radial striae. *Triplecia extans* and *T. cuspidata* are both striate, the latter much more strikingly so than the former. After examining a large number of specimens from Watertown, Martinsburg, Trenton Falls, and elsewhere, it would appear that *T. extans* is characterized by a rounded sinus, *T. cuspidata* by an angular or grooved sinus, and a new species, now to be named, by a flat-bottomed sinus.

In my judgment, one of the specimens figured by Hall and Clark as *Triplecia extans*, is a very typical *T. cuspidata*, and I have so assigned it above. It displays the typical angular sinus. Figures 6 and 7 of the same plate show the rounded sinus of *T. extans*.

The exact horizon at which the various species of Triplecia occur has not yet been determined. Hall stated that *T. cuspidata* was known to him as occurring only in the central part of the Trenton limestone at Lowville, a town only five miles north of Martinsburg. I did not have time to search for the original locality, but from the nearness of Lowville to Martinsburg it seems probable that the original specimens were really from the base of the Trenton, which is the only horizon in which this species is found at Martinsburg. In the M. C. Z. there are a great many specimens of this species from Watertown, N. Y., but unfortunately without exact data as to the horizon in the Trenton from which they were obtained. There are also two large specimens in a fragment of rock from Trenton Falls. The matrix has on it the impression of a specimen of Phragmolites, thus showing that these two forms occur together at Trenton Falls as well as at Martinsburg.

TRIPLECIA SCHUCHERTI, sp. nov.

Plate 1, fig. 7–12.

Shell large, of about the same size and shape as that of *T. cuspidata*, but generally a little plumper. The length and thickness are nearly equal, the thickness equalling the length in some cases. The beaks of the opposite valves are so closely opposed as to practically eliminate a cardinal area. The brachial valve has a relatively narrow rounded fold which does not project at the front, and which is bordered by very shallow depressions. The fold is not so high and angular as in either *T. cuspidata* or *T. nuclea*, but more like that of *T. extans*. The sinus in the pedicle valve is rounded at the bottom in the posterior part of its course, but flat at the front and not deep. While this shell attains the large size of *T. cuspidata*, it evidently resembled *T. extans* in its younger stages, and is probably most nearly allied to that species.

The surface is marked by both concentric and radial lines, the latter, like those on *T. extans*, being most prominent toward the anterior margin of the shell. Large specimens of both this species and *T. cuspidata* often show obscure radial plications as well as striae.

The type (M. C. Z. 8,534) selected as the best preserved of a dozen specimens at hand, is 22 mm. long, 28 mm. wide, and 21 mm. thick. A smaller specimen is 17 mm. long, 22 mm. wide, and 15.5 mm. thick. The largest is 24 mm. long, 31 mm. wide, and 20 mm. thick.

Seven of the specimens were collected by the writer from the base of the Trenton at Martinsburg, and there are five more in the M. C. Z. from the Trenton at Watertown, N. Y.

PARASTROPHIA ROTUNDA (Winchell & Schuchert).

Anastrophia? hemiplicata var. *rotunda* Winchell & Schuchert, Pal. Minn., 1893, **3**, p. 383, pl. 30, fig. 32–35.

While it is the common custom to refer all the forms of Parastrophia found in the Trenton to one species, Winchell and Schuchert conferred a varietal name on a very rotund form which they obtained from the Galena (Prosser) limestone of Minnesota. I found in the lowest Trenton at Martinsburg three specimens of an equally rotund

Parastrophia, which, differing in many respects from the original specimens, may perhaps, considering the variability of the members of this genus, be included in the Minnesotan group, as a species rather than a variety.

Winchell and Schuchert state that their variety is "distinguished in having the length and width nearly equal, the valves more convex, and the plications somewhat more pronounced in the fold and sinus and less numerous in the lateral portions of the shell." No further description is given, but the single specimen figured is large (15 mm. long), has three broad plications on the fold, two in the sinus, and a pair on either side of the fold and sinus.

The three specimens found at Martinsburg are fully as convex as the Minnesotan specimen, but the largest is only 10 mm. long, and all have more and narrower plications in the fold and sinus. Two of them have four plications on the fold and three in the sinus, and the third, the largest, has four in the sinus. Two of them have two and one of them three plications on each side of the fold and sinus.

This rather detailed description is given because of the increasing necessity of more definite knowledge of the limits of variation, and the possibility of distinguishing species of Parastrophia.

PARASTROPHIA HEMIPLICATA Hall.

Atrypa hemiplicata Hall, Pal. N. Y., 1847, 1, p. 144, pl. 33, fig. 10.

To assist in a study of *Parastrophia hemiplicata* which must ultimately be made, it is worth while to record the characteristics of any specimens whose horizon is definitely known. Fourteen specimens were found in the lower thirty feet of the Trenton, but a number of these were too poorly preserved to yield any satisfactory information. The following table shows the principal characteristics:

Length	Width	Thickness	Plications on fold	In sinus	On one side
9 mm.	11	6	5	4	2
10	11	6	5	4	2
11	14		5	4	3
10	11	7	6	5	3
14	15	8	7	6	3
11	13	10	4	3	2
10	14			3	3
12	14	8	4	3	3
14		14	4	3	2
10	13			4	2

It will be noted that all the specimens show plications on the sides of the fold and sinus. Moreover, there are obviously two distinct groups, one with four plications in the sinus of the young, and the other with only three plications in the sinus of the adult. The first five belong to the first group, and also, probably, the last one, while the other four belong to the second. The two specimens at the head of the list are evidently immature, as is shown by their thinness and their very short plications. With further growth new plications are added in the fold and sinus as well as at the sides, and number five is probably a typical adult.

No very young specimen of the second group has been found, but the presence of only three plications in the adult shows that it could not have been developed from such young as numbers one and two.

Only one specimen was collected from the Upper Trenton, a pedicle valve found about 400 feet above the base. It agrees with the second type in the table above, being 10 mm. long, 12 mm. wide, with three plications in the sinus and two on the sides.

Miss Wilson, in her studies of *Parastrophia hemiplicata* from about Ottawa (Mus. bull. 2, Geol. surv. Canada, 1914) found specimens with three to five plications in the sinus and plications on the sides of the fold in both Middle and Upper Trenton.

GASTROPODA.

SINUITES CANCELLATUS (Hall).

Bellerophon bilobatus Emmons, Geol. N. Y., 1842, **2**, p. 392, fig. 6.

This species was found to be exceedingly common at horizon 70. It also occurred at horizons 15, 20, 390, and 410, but was not seen in the Middle Trenton. In the basal beds, where some other forms were so common, it was absent. At horizon 70, in actual numbers, as the following list shows, it many times exceeded in abundance all other forms collected. The fossils from this horizon, with the number of specimens collected, which the writer can attest to be a fair index to their relative abundance, are listed below: —

9 *Prasopora simulatrix* v. *occidentalis* Ulrich. 1 *Schizocrania filosa Hall.* 106 *Sinuites cancellatus* (Hall). 6 *S. cancellatus* v. *corrugatus* (Hall). 1 *Pleurotomaria* (*Trochonema?*) *ambigua* Hall. 1 *Hormotoma trentonensis* (Ulrich & Scofield). 4 *Ctenodonta levata* (Hall). 3 *Calymene senaria* Conrad — a total of 131.

CRUSTACEA.

CRYPTOLITHUS TESSELLATUS Green.

Cryptolithus tessellatus Green, Monog. N. Amer. trilobites, 1832, p. 73, pl. 1, fig. 4.

In Quebec, eastern New York, and central Pennsylvania, *Cryptolithus tessellatus* is one of the most common fossils in the lower part of the Trenton, but in Ontario, Wisconsin, Minnesota, and Iowa it has not yet been found. Even at Trenton Falls the species is so rare that it has been found only a few times by local collectors, who formerly spent a great deal of time searching for rare fossils in that vicinity. North of Trenton Falls and west of the Adirondacks it has not previously been reported.

The specimens, which were all found in one layer about 100 feet above the base of the section, seem to be quite typical, though all rather small. In front of the girder there are two rows of pits, and back of it at the sides there are three rows bordering the bases of the lateral mounds. In front of the glabella there are three rows of pits. Eye-lines are absent as is usual in the adult.

EXPLANATION OF THE PLATE.

EXPLANATION OF THE PLATE.

Fig. 1–3. *Triplecia cuspidata* (Hall). Posterior, lateral, and anterior views of a specimen of average size from the base of the Trenton at Martinsburg. Natural size.

Fig. 4–6. The same species, from the same locality. Anterior views of three specimens to show variation in shape of sinus, with persistence of the central groove. Natural size.

Fig. 7–9. *Triplecia schucherti* Clark. Posterior, lateral, and anterior views of the holotype, a large specimen from the base of Trenton at Martinsburg. Natural size.

Fig. 10, 11. The same species, from the same locality. Posterior and anterior views of a specimen with a very high narrow fold, but a flat-bottomed sinus. Natural size.

Fig. 12. The same species from the same locality. A smaller specimen with a low rounded fold, and a flat-bottomed sinus. Natural size.

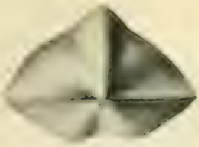
Fig. 13–15. *Triplecia extans* (Emmons). Posterior, lateral, and anterior views to show the high fold with the evenly rounded sinus. Natural size.

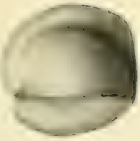
Fig. 16. *Phragmolites compressus* Conrad. A photograph of a specimen from the base of the Trenton at Martinsburg. Natural size.

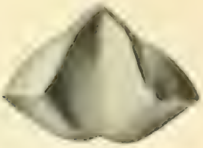
Fig. 17. *Cheirocrinus anatiformis* (Hall). A photograph of two fragmentary specimens from the upper part of the Trenton at Martinsburg, to show the pectinirhombs. Natural size.

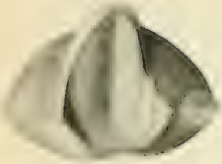
Fig. 18. *Carneyella raymondi* Clark. A photograph of the type, resting on the anterior part of the pedicle valve of a Rafinesquina. From the base of the Upper Trenton at Martinsburg. Twice natural size.

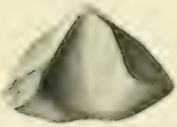
Fig. 19. The same specimen. An enlarged drawing. 4.5 times natural size.

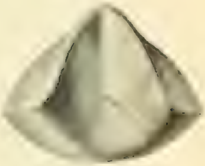

1

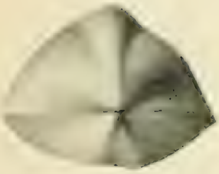

2

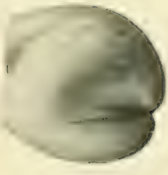

3

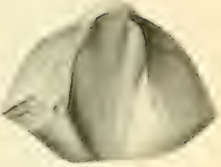

4

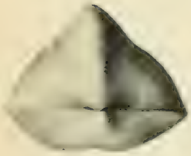

5

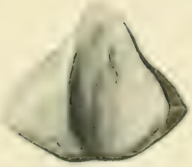

6

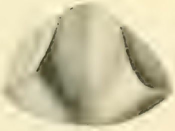

7

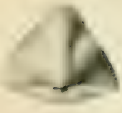

8

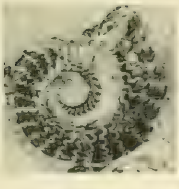

9

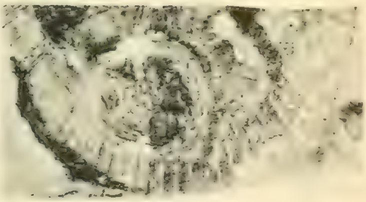

10

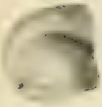

11

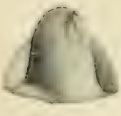

12

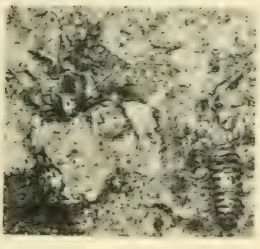

13

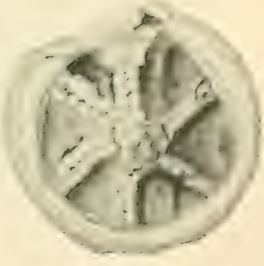

16


17


14


15


18


19

Bulletin of the Museum of Comparative Zoölogy
AT HARVARD COLLEGE.
Vol. LXIII. No. 2.

SOME CRITICAL NOTES ON BIRDS.

By Outram Bangs and Thomas E. Penard.

CAMBRIDGE, MASS., U. S. A.:
PRINTED FOR THE MUSEUM.
June, 1919.

No. 2.— *Some Critical Notes on Birds.*

By Outram Bangs and Thomas E. Penard.

For some time past we have been working together on the Lafresnaye Collection of birds which a few years ago the Boston Society of Natural History most generously and wisely gave to the Museum of Comparative Zoölogy.

We intend later to publish an account of the collection, its types, a sketch of Lafresnaye's life, a list of his published papers, etc., etc. Of this we have already done much.

In the meantime we publish the following rather random notes — mostly changes in names and descriptions of new forms, noticed while identifying the Lafresnaye types.

We are much indebted to Dr. C. W. Richmond for his valuable opinion, always cheerfully given, on many points of involved nomenclature in connection with our study of the Lafresnaye Collection, and to the authorities of the U. S. National Museum, the American Museum of Natural History, and the Field Museum of Natural History for the loan of specimens.

PTERODROMA HAESITATA (Kuhl).

Procellaria haesitata Kuhl, Beitr. zool., 1820, p. 142 ("Mers de l'Inde").

Procellaria diabolica Lafresnaye, Rev. zool., 1844, p. 168 (Guadeloupe).

Cotype. — M. C. Z. 73,221, Lafr. coll. 8,000.

Cotype. — M. C. Z. 73,222, Lafr. coll. 8,002.

Procellaria meridionalis Lawrence, Ann. Lyc. nat. hist. N. Y., 1848, **4**, p. 475.

There were originally three cotypes in the Lafresnaye Collection. One of these, 8,001, was exchanged in 1886 with Prof. Alfred Newton. The original labels of all three specimens are now missing.

Noble (Bull. M. C. Z., 1916, **60**, p. 370) discusses this species at length, and gives measurements of *A. diabolica* and of some specimens which he considers different, and to which he applies the name *Aestrelata haesitata* (Kuhl). He assumes quite correctly that the larger bird is Lafresnaye's *P. diabolica*. Computing Kuhl's measurements of *P. haesitata* on the basis of the "Pied du Roi" and the "Frankfurt A. M. inch," and assuming that Kuhl, as a student of Temminck, used the French system of measurements, he comes to the conclusion that Kuhl's *P. haesitata* applies to the smaller bird and accordingly restricts the name in that sense.

Fortunately Kuhl's type is available to-day in the Leyden Museum. It was listed with another specimen by Schlegel (Mus. Pays-Bas. Mon. Procellariae, 1863, p. 13) under the name *Procellaria haesitata* Kuhl. Schlegel gives measurements of both specimens, which indicate a large bird.

Dr. E. D. van Oort of the Leyden Museum, at our request, has very kindly examined Kuhl's specimens, and writes us as follows:—

"There are in the collection of our Museum two specimens of *Aestrelata haesitata* (Kuhl), both originally labelled by Temminck: *Procellaria hasitata*, Mers de l'Inde. They are both the types of *Procellaria haesitata* Kuhl (Beitr. 1820, p. 142) and of *Procellaria hasitata* in Temminck's Pl. col. V, 1826, pl. 416. Temminck's plate, however, is not correct, the upper tail coverts, as well as the under tail coverts, being pure *white*, not grey. The two specimens are exactly alike. Schlegel mentions these in his catalogue of the Procellariae (Mus. Pays-Bas, Proc., *Procellaria haesitata*, p. 14) but he wrongly designates only No. 1 as the type of the species, and changes Temminck's locality "Mers de l'Inde" into "Ocean."

"The measurements of the two specimens are:—

	Schlegel's Cat. No. 1	No. 2.
	mm.	mm.
Wing (without pressing down)	310	310
Tail (from base of free tail feathers)	130	131
Bill (to angle of mouth)	44	43
Culmen	35	35
Tarsus	35	36
Middle toe with claw	55.5	55.5

"In my opinion *haesitata* and *diabolica* are the same."

It is evident from the above that Kuhl's cotypes are both large birds agreeing very well in size with the types of *P. diabolica*, except that the wing measurement is even greater. We agree with Dr. van Oort that *P. haesitata* Kuhl and *P. diabolica* Lafresnaye are the same. Obviously the name *haesitata* should be used for the species.

The two small specimens which Noble (*loc. cit.*, p. 372) considered a different species, to which he applied the name *Aestrelata haesitata*, we do not regard specifically different from the larger birds. The difference in the nostril tubes pointed out by Noble does not appear to be due to a normal condition, but rather one of distortion in drying. Noble refers *P. meridionalis* Lawrence, which is a very large bird, to his *P. haesitata* on the ground that the nostril tubes (and coloration) are like those of the small birds. In our opinion *P. meridionalis* is *P. haesitata* Kuhl with normal nostril tubes. At any rate there is great variation in the specimens, and we refer the small birds which Noble considered a different species to *P. haesitaia* Kuhl, rather than to rename them on the evidence at hand.

A female taken at Pittsfield, N. H., August, 1893, by H. W. Osgood, now in the collection of William Brewster (46,076) has normal nostril tubes, but is a small bird; it affords the following measurements:—wing, 265; tail, 128; bill (to angle of mouth), 37; culmen, 32; tarsus, 35; middle toe, with claw, 50.

Lafresnaye's reference to two species, a larger and smaller, which arrive at different times of the year and nest at different heights, is interesting, but there is no reason for assuming that the two small specimens in the M. C. Z. represent the smaller species referred to by Lafresnaye. It is also interesting to note in this connection that Père Labat's illustration of the Diablotin (Nouv. voy., 1724, **2**, p. 349) represents a uniformly dark-colored bird, and on the next page he writes, "son plumage est noir."

HERPETOTHERES CACHINNANS QUERIBUNDUS, subsp. nov.

Type.— M. C. Z. 7,792. Brazil: Pernambuco. J. C. Fletcher.

Characters.— Similar to *H. cachinnans cachinnans* (Linné) of Guiana but paler, the upper parts browner, much less blackish, the lower parts whiter; similar also to *H. c. chapmani* Bangs and Penard of Mexico but slightly smaller and with very much less spotting on axillars and lining of wing.

Measurements.

No.	*Locality*	*Sex*	*Wing*	*Tail*	*Tarsus*	*Culmen from Cere*
7,792 M. C. Z.	Pernambuco	?	258	196	23.5	55
110,476 U. S. N. M.	Santarem	?	257	198	22	58
16,526 "	Parana	?	267	195	22	54

Remarks.— The new form is decidedly paler than *H. c. cachinnans;* in this respect it is like the northern *H. c. chapmani*, from which it differs in the almost immaculate lining of the wing. *H. c. chapmani* has the axillars and under wing coverts much, often heavily, spotted with rusty.

There are now five forms of this species, which, though close, are recognizable; they are:—

Herpetotheres cachinnans cachinnans (Linné). Guianas; Venezuela?

Herpetotheres cachinnans queribundus Bangs and Penard. Southern Brazil; Paraguay; Bolivia.

Herpetotheres cachinnans maestus Bangs and Noble. Northwest Peru; southwest Ecuador?

Herpetotheres cachinnans fulvescens Chapman. Tropical zone of Pacific coast from eastern Panama to Ecuador.

Herpetotheres cachinnans chapmani Bangs and Penard. Mexico to western Panama.

EUPSITTULA ASTEC VICINALIS, subsp. nov.

Type.— M. C. Z. 48,482. Adult ♂. Mexico: Tamaulipas. Altamira. 24 December, 1908. F. B. Armstrong.

Characters.— Similar to *E. astec astec* (Souancé), Vera Cruz to Costa Rica, but paler and brighter green above and much paler and greener, less brownish, below; upper parts between Parrot-green and Calliste-green (of Ridgway); throat and chest light yellowish olive; middle of breast and belly Javel-green.

Measurements.— *Type*, adult ♂; wing, 141; tail, 119; culmen from cere, 19. *Topotype*, M. C. Z. 48,480, adult ♀; wing, 135; tail, 111; culmen from cere, 19.

Remarks.— While collecting for Dr. John C. Phillips in Tamaulipas, F. B. Armstrong took ten specimens of this new paroquet at Altamira in December, 1908. There is no variation in the series, and when laid out beside a series of true *E. astec* the Tamaulipas birds look almost as if they represented a distinct species, so much paler and brighter are they in color.

PTEROPHANES CYANOPTERUS (Fraser).

Trochilus cyanopterus Fraser ex. Loddiges's Ms., Proc. Zool. soc., 1840, p. 17 (no type-locality given).

Ornismya temminckii (not *Ornismya temminckii* Lesson, 1829 = *Heliomaster squamosus* (Temminck)) Boissonneau, Rev. zool., 1839, p. 354 (Bogotá).

The name which has so universally been used for Temminck's Sapphire-wing unfortunately cannot prevail on account of preoccupation, and Fraser's *cyanopterus* appears to be the first available for it.

Synallaxis brachyurus brachyurus Lafresnaye.

Synnalaxis brachyurus Lafr., Rev. zool., 1843, p. 290 (Colombia).

Type.— M. C. Z. 77,256, Lafr. coll. 2,456.

Synallaxis pudica Sclater, Proc. Zool. soc. London, 1859, p. 191 (Bogotá).

We have carefully compared the type, an immature bird with a short, undeveloped tail, with the various forms of *Synallaxis pudica* and with *Synallaxis subpudica* Sclater. We find *Synallaxis pudica* Sclater identical with *S. brachyurus brachyurus* Lafr.

The subspecies now become: —

Synallaxis brachyurus brachyurus Lafresnaye.
Synallaxis brachyurus nigrifumosa Lawrence.
Synallaxis brachyurus caucae Chapman and

Synallaxis brachyurus chapmani, subsp. nov.

Type.— M. C. Z. 124,478. Adult ♂. Colombia: Jiminez, tropical zone of Pacific slope. 6 April, 1904. M. G. Palmer.

Characters.— Most nearly like *S. b. nigrifumosa*, but back less olivaceous, more grayish, and under parts much paler and grayer. Chestnut of pileum and wings darker than in *S. b. brachyurus* and very much darker than in *S. b. caucae*. Size large. *Type*, adult ♂; wing, 66; tail, 80; tarsus, 23; exposed culmen, 15.

Chapman (Bull. Amer. mus. nat. hist., 1917, **36**, p. 404) has already called attention to this race from western Colombia, but has not named it. We consider it quite as well marked as any of the other subspecies.

Dendrocincla lafresnayei christiani, subsp. nov.

Type.— M. C. Z. 124,522. Adult ♀. Colombia: near Pavas, Pacific slope of western Andes. 10 March, 1908. M. G. Palmer.

Characters.— Similar to *D. l. lafresnayei* Ridgway of eastern Colombia, and of about the same size, but much darker in color, and more olivaceous, less brownish throughout; darker and more olivaceous even than *S. l. ridgwayi* Oberholser of Panama and Costa Rica.

Measurements.— *Type*, adult ♀; wing, 101; tail, 80; tarsus, 23; exposed culmen, 26. *Topotype*, M. C. Z. 124,523, adult ♂; wing, 109; tail, 88; tarsus, 23; exposed culmen, 27.

Remarks.— We have named this bird in honor of Christian de Lafresnaye, Lt. Colonel d'artillerie en retraite, to whom we are indebted for much assistance in bringing together material for a sketch of the life of his illustrious father.

PICOLAPTES AFFINIS LIGNICIDA, subsp. nov.

Type.— M. C. Z. 49,359. Adult ♂. Mexico: Tamaulipas, Galindo. 24 March, 1909. F. B. Armstrong.

Characters.— Similar to *P. affinis affinis* (Lafr.), but very much paler and grayer throughout; back more olivaceous, less reddish brown; head much grayer, less brownish; under parts paler, grayer, and wholly lacking the rich brown (raw umber) coloring of the under parts in *C. affinis affinis.* Size about the same.

Measurements.— *Type*, adult ♂; wing, 108; tail, 95; tarsus, 21; exposed culmen, 28. *Topotype*, M. C. Z. 49,354, adult ♀; wing, 107; tail, 99; tarsus, 21.5; exposed culmen, 28.

Remarks.— Mr. Armstrong collected a series of eleven skins of this strongly marked northern race of *P. affinis* among the very arid tropical hills of the region north and west of Ciudad Victoria. At the time Dr. J. C. Phillips reported on the Armstrong Collection (Auk, January, 1911, **28**, p. 67) we lacked adequate material of true *P. affinis*, though we had large series of *P. affinis neglectus* Ridgway, and Dr. Phillips considered the Armstrong skins to represent the northern form as distinguished from *neglectus*. In reality the Tamaulipas bird is very distinct, while *affinis* and *neglectus* are exceedingly close forms, hardly distinguishable except in long series.

MUSCISAXICOLA MACLOVIANA MENTALIS d'Orbigny and Lafresnaye.

Muscisaxicola mentalis d'Orb. and Lafr., Mag. zool. Syn. avium, 1837, p. 66 ("Habit. Cobija, in Bolivia; Arica, atque Patagonia").

Cotype (?). — M. C. Z. 77,316, Lafr. coll. 4,599.

Muscisaxicola albimentum Lafresnaye, Rev. et mag. zool., 1855, p. 61 (type-locality not stated, label gives "Bolivia et Patagonia").

Type.— M. C. Z. 77, 323, Lafr. coll. 4,607.

In addition to the cotype (?) of *M. mentalis* and the type of *M. albi-*

mentum, there is another specimen from Chile in the Lafresnaye Collection, M. C. Z. 77,317, Lafr. coll. 4,600. These three specimens are very much smaller than any of a large series from the Falkland Islands in M. C. Z., from which we consider them subspecifically distinct. We therefore revive the name *mentalis* for the small continental form.

Sclater (Cat. birds Brit. mus., 1888, **14**, p. 55) doubtfully places *M. albimentum* Lafr. in the synonymy of *M. cinerea* Philippi and Landbeck. The type is a specimen without the brown spot on the chin, and we identify it with certainty as *Muscisaxicola macloviana mentalis* d'Orb. and Lafr. of which it is presumably a female, as Lafresnaye himself at first thought.

In designating our specimen of *M. mentalis* d'Orb. and Lafr. as a cotype, we offer the following explanation:—

The types of the species originally described in joint authorship by d'Orbigny and Lafresnaye are generally supposed to be in the Paris Museum, and undoubtedly the specimens there have a just claim to that distinction. We know, however, that many of these species were represented by several individuals, and in such cases Lafresnaye obtained from d'Orbigny a specimen, or several specimens, for himself. It is even possible that the descriptions were made from Lafresnaye's specimens, since it is known that he did most of the work in connection with the preparation of the manuscripts of papers published in joint authorship with d'Orbigny.

Under the circumstances, and in absence of positive proof to the contrary, we think the specimens in the Lafresnaye collections should be considered cotypes whenever there is sufficient information to indicate that they were of d'Orbigny's collecting. Evidence of this nature is to be found on the old labels in the form of a statement of the locality, exactly as originally published, often accompanied by d'Orbigny's name. In our proposed account of the Lafresnaye Collection we shall enter such specimens as cotypes followed by a query to indicate the doubtful status of the specimen, in the manner indicated above. In all instances we shall give an exact copy of the labels, so that ornithologists may decide for themselves upon the merits of each individual case.

MUSCISAXICOLA ALBILORA ALBILORA Lafresnaye.

Muscisaxicola albilora Lafr., Rev. et mag. zool., 1855, p. 60 (type-locality not stated — we select Vicinity of Santiago, Chile).

Type.— M. C. Z. 77,322, Lafr. coll. 4,604.

Muscisaxicola rubricapilla Philippi and Landbeck, Archiv. naturgesch., 1865, **1**, p. 90 ("Cordillera der Hacienda de la Puerta, Provinz Colchagua," Chile).

The specimen which proves to be the type of Lafresnaye's *Muscisaxicola albilora* was listed by Verreaux in his Catalogue of the Lafresnaye Collection as *Muscisaxicola rufivertex*, and by Sclater (Cat. birds Brit. mus., 1888, **14**, p. 58) doubtfully as a synonym of *Muscisaxicola juninensis* Tackzanowski. A comparison with *M. juninensis* and *M. rubricapilla* shows beyond doubt its identity with the latter, which it antedates by ten years. The two subspecies should now stand as: —

Muscisaxicola albilora albilora Lafr.

Muscisaxicola albilora juninensis Tackz.

TACHURIS Lafresnaye.

Tachuris Lafresnaye, Echo du monde savant, 12 June, 1836, p. 107.

Type.— *Regulus omnicolor* Vieillot, Gal., 1834, **1**, p. 271, pl. 166 = *Sylvia rubrigastra* Vieillot, 1817.

Tachuris d'Orbigny and Lafresnaye, Mag. zool. Syn. avium, 1837, p. 55.

Cyanotis Swainson, Class. birds, 1837, **2**, p. 243.

Type.— *Regulus omnicolor* Vieillot.

The generic name Tachuris Lafresnaye (1836), having priority over Cyanotis Swainson (1837), must replace it. The two forms contained in this genus are: —

Tachuris rubrigastra rubrigastra (Vieillot).

Tachuris rubrigastra alticola (Berlepsch and Stolzmann).

MYIOCHANES ARDOSIACUS CINERACEUS (Lafresnaye).

Tyrannula cineracea Lafr., Rev. zool., 1848, p. 7 (Caracas, Venezuela).

Type.— M. C. Z. 83,338. Lafr. coll. 8,400.

Myiochanes ardosiacus polioptilus Todd, Ann. Carnegie mus., 1912, **8**, p. 208 (Lagunita de Aroa, Estado Lara, Venezuela).

In some manner Lafresnaye's name *Tyrannula cineracea*, long ago became applied to the South American black phoebe, and that bird ever since has figured as *Sayornis cineracea* (Lafr.) or *Sayornis nigricans cineracea* (Lafr.).

Lafresnaye's description certainly does not fit the South American black phoebe, but agrees exactly with his type-specimen now before us, which is not a Sayornis but a Myiochanes, the wide bill, pale lower mandible, and gray colors all being mentioned by Lafresnaye.

We give the following brief description of the type, possibly a little faded by long exposure to light:—

First primary shorter than fifth and longer than sixth (from outside). Wing, 84; tail, 71; tarsus, 16; exposed culmen, 15. Crown well crested, dusky; upper parts gray, about between mouse-gray and deep mouse-gray of Ridgway, lores whitish; wings dusky, no conspicuous wing-bands; tail dusky, outer web of outer rectrix whitish; below mouse-gray, throat whitish and middle of abdomen white. Most nearly like *Myiochanes ardosiacus ardosiacus* (Lafr.) but slightly smaller, paler, and grayer in general coloration, with the throat whitish, middle of belly white and outer web of outer rectrix whitish.

Sayornis cineracea of authors, not of Lafresnaye, must become *Sayornis nigricans latirostris* (Cabanis and Heine).

HELEODYTES PALLESCENS (Lafresnaye).

Campylorhynchus pallescens Lafresnaye, Rev. zool., 1846, p. 93 ("Mexique" — error, type-locality unknown, we suggest S. W. Ecuador).

Type.— M. C. Z. 76,137, Lafr. coll. 2,613.

Campylorhynchus pallidus Lafresnaye, Rev. zool., 1846, p. 94.

Type.— M. C. Z. 76,137, Lafr. coll. 2,613.

Campylorhynchus palliceps Lafresnaye Ms. Ridgway, Proc. Boston soc. nat. hist., 1887, **23**, p. 384.

Type.— M. C. Z. 76,154, Lafr. coll. 2,614.

Campylorhynchus balteatus Baird, Rev. Amer. birds, 1864, p. 97, 98, 103.

(*Type* from Babahoyo, Ecuador, ex Sclater, Cat. Amer. birds, 1862, p. 16, species 102).

We do not hesitate to pronounce *Campylorhynchus pallescens* identical with *Campylorhynchus balteatus* Baird of western Ecuador and northwestern Peru. Lafresnaye's type has two labels which read respectively "*Thryot. pallidus* ou *pallescens* . . . . (Florent Mexique ?)" and "*Camp. pallescens* nob. rev. 1846, 93 (Mexique)." The doubt in regard to the source of the specimen, indicated on the first of these labels, is reflected in the guarded statement made by Lafresnaye in the original description, "Il nous a été vendu comme du Mexique."

A careful examination of the type-specimen reveals that the narrow bars and transverse markings on the breast, referred to by Ridgway (*loc. cit.*, p. 385), are on a few feathers which do not belong to the bird, but which had been glued on by the taxidermist to cover some bare spots. The feathers on these patches are wider and of a wholly different shape from those belonging to the bird. The bird's own breast-feathers are spotted as in *H. balteatus,* and not barred or lined. We cannot detect any difference in the width of the white and dusky bands across the remiges from those in the specimens of *H. balteatus* from Peru which we have before us, and with which the type of *H. pallescens* agrees in size and very closely in all respects except that the darker markings are paler and more grayish brown instead of blackish, due to fading from long exposure to the light.

HYLOCICHLA MINIMA MINIMA (Lafresnaye).

Turdus minimus Lafresnaye, Rev. zool., 1848, p. 5 ("Habitat ad Bogotam, in Nova-Grenada").

Type.— M. C. Z. 76,498, Lafr. coll. 3,541.

Hylocichla aliciae bicknelli Ridgway, Proc. U. S. N. M., 6 April, 1882, **4**, p. 377 (Slide Mt., Ulster Co., New York).

Apparently no ornithologist of the present generation had examined the type of *Turdus minimus* Lafresnaye, until we recently did so. By common consent the name has appeared in all modern works among the synonyms of *Hylocichla ustulata swainsoni* (Cabanis). We were therefore surprised upon comparing the type to find that not only is it an Alice's Thrush and not a Swainson's Thrush, but that it is an extreme example of the southern form of Alice's Thrush, always known as *Hylocichla aliciae bicknelli* Ridgway. If the specimen really came from Bogotá as Lafresnaye thought it did, it is also the southernmost record for the subspecies, which otherwise has not been found wintering in South America. In order to be certain that our identification might not be questioned, we have submitted the type to the following American ornithologists, Messrs. Batchelder, Brewster, Faxon, Oberholser, and Richmond, who all agree with us.

The two subspecies are:—

Hylocichla minima minima (Lafr.).

Hylocichla minima aliciae (Baird).

TURDUS NUDIGENIS Lafresnaye.

Turdus nudigenis Lafresnaye, Rev. zool., 1848 (January), p. 4 (Caracas, Venezuela).

Type.— M. C. Z. 76,501, Lafr. coll. 3,551.

Turdus gymnophthalmus Cabanis, Schomburgk's Reis. Brit. Guiana, 1848 (= 1849?) **3**, p. 665 (British Guiana).

Turdus nudigenis Lafresnaye certainly has priority over *Turdus gymnophthalmus* Cabanis, even though the numbers of the Revue zoologique may not have been issued in the months of which they bear the dates. Hartlaub (Archiv. naturgesch., 1850, **2**, p. 51) includes Schomburgk's Reisen in his "Bericht über die vögel während des Jahres 1849." We find also that the volume in question contains a third list of subscribers which we have every reason to believe was made out after the second list appearing in the second volume, which is dated "bis ende Februar 1848."

Dr. Chas. W. Richmond writes (*in litt.*) that the third volume of Schomburgk was probably published early in 1849.

TURDUS RUFOPALLIATUS Lafresnaye.

Turdus rofopalliatus Lafresnaye, Rev. zool., 1840, p. 259 ("Monterey en Californie," — error, we substitute Acapulco, Southwestern Mexico).

Type.— M. C. Z. 76,520, Lafr. coll. 3,568.

Merula flavirostris (not *Turdus flavirostris* Horsfield, 1821) Swainson, Philos. mag., 1827, new ser., **1**, p. 369 (Temascaltepec, Mexico).

This bird was collected by Léclancher on the voyage of the VENUS. The expedition stopped at Monterey, California, but the specimen was probably not taken there. The name *Turdus rufopalliatus,* to replace *Merula flavirostris* Swainson, must be used by all ornithologists who, like ourselves, unite Planesticus and Turdus.

COSSYPHA NIVEICAPILLA NIVEICAPILLA (Lafresnaye).

Turdus niveicapillus Lafresnaye, Mém. Soc. acad. Falaise. Essai nouv. man., 1838, p. 16 (Senegal).

Type.— M. C. Z. 76,465, Lafr. coll. 3,938.

Cossypha verticalis Hartlaub, Verz. Hamb., 1850, p. 23.

The specimen which proves to be the type of *Turdus niveicapillus* Lafr. was entered by Verreaux in the Catalogue of the Lafresnaye Collection as *Bessonornis swainsoni* Bp. A careful comparison of specimens proves that Lafresnaye's bird is what has been currently called *Cossypha verticalis* Hartlaub. Lafresnaye's name must, of course, be used for the species, antedating Hartlaub's by twelve years.

Races of Saltator Striatipictus Lafresnaye.

We have before us a series of 104 skins of *Saltator striatipictus*, a careful study of which forces us to recognize six races, two of which are here described as new. It is possible to find examples of one race which agree very nearly with some of another, but the different races, in series, stand out very definitely.

Young birds are more heavily marked and darker below than adults, and old birds in breeding plumage are somewhat grayer above than they are in winter or autumn.

1. Saltator striatipictus furax, subsp. nov.

Type.— M. C. Z. 118,651. Adult ♂. Western Costa Rica: near Boruca. 27 May, 1906. C. F. Underwood.

Characters.— Similar to *Saltator striatipictus striatipictus* Lafresnaye, differing in being slightly smaller, and much darker below; the stripes on the under parts very wide and heavy and olive-green; the dark stripes cover the whole under parts often including the belly, and tend to coalesce at the sides of the breast and sides of the neck. This form is most nearly related to *S. striatipictus isthmicus* Sclater; it is of about the same size, but much darker and greener below and more heavily striped. The very darkest specimens of *isthmicus* (possibly immature birds) resemble closely the very palest examples of the new form.

Measurements.— *Type*, adult ♂; wing, 90; tail, 82; tarsus, 22.5; exposed culmen, 18.

Specimens examined.— Twenty-one from western Costa Rica; Boruca, Lagato, and El General.

2. Saltator striatipictus isthmicus Sclater.

Saltator isthmicus Sclater, Proc. Zool. soc. London, 1861, p. 130 (Panama).

Type-locality.— Panama.

Characters.— Similar to *S. s. striatipictus* but slightly smaller, the under parts more greenish or yellowish, less purely white and the stripes rather heavier and more olive greenish, less grayish.

Specimens examined.— Twenty-one from Panama; near Panama City and Loma del Leon.

3. SALTATOR STRIATIPICTUS SPERATUS, subsp. nov.

Type.— M. C. Z. 40,501. Adult ♂. Sabago Island, Pearl Islands, Bay of Panama. 6 April, 1904. W. W. Brown, Jr.

Characters.— This form is about the size of *S. s. isthmicus* and slightly smaller than *S. s. striatipictus*; in color and markings it is intermediate, *i.e.*, it is slightly more yellowish or greenish below than *striatipictus* and less heavily striped on the under parts than *isthmicus*.

If this were not an island form we would be inclined not to give it a name, but to call it a connecting link between the two races.

Measurements.— *Type*, adult ♂; wing, 93; tail, 88; tarsus, 23; exposed culmen, 18.

Specimens examined.— Forty from Pearl Islands; Sabago Island, and San Miguel Island.

4. SALTATOR STRIATIPICTUS STRIATIPICTUS Lafresnaye.

Saltator striatipictus Lafr., Rev. zool., 1847, p. 73.

Type-locality.— Caly, Colombia.

Characters.— Size slightly larger than in the preceding forms; under parts nearly white, very little tinged with greenish or yellowish; stripes on under parts fewer, narrower, and more grayish, less greenish in color.

Specimens examined.— Fourteen, from Colombia; Caly (one cotype), "New Grenada," Jimenez, San Luis Bitaco Valley, La Maria Dagua Valley, Santa Marta, and Trinidad. (The Trinidad bird may represent still another form.)

5. SALTATOR STRIATIPICTUS PERUVIANUS Cory.

Saltator peruvianus Cory, Publ. 190 Field mus. nat. hist. ornith. ser., 1916, **1**, p. 345.

Type-locality.— Hda. Limon, 10 miles west of Balsas, northern Peru.

Characters.— Much larger than *S. s. striatipictus* (wing in ♂ 100–

104); under parts heavily striped with olive-green, much as in *isthmicus,* but with the ground color whiter, much less greenish or yellowish.

Specimens examined.— Six from northwest Peru; Huancabamba.

6. SALTATOR STRIATIPICTUS IMMACULATUS Berlepsch and Stolzmann.

Saltator immaculatus Berlepsch and Stolzmann, Proc. Zool. soc. London, 1892, p. 375.

Type-locality.— Peru; Lima.

Characters.— About the size of *peruvianus,* but with the stripes on under parts very faint and confined to the sides, the whole median under parts nearly immaculate whitish.

Specimens examined.— Two from "Coast of Peru." These were collected on the voyage of the VENUS, and are cotypes of Lafresnaye's manuscript name *Saltator albiventris.*

CHLOROPHONIA PYRRHOPHRYS (Sclater).

Euphonia pyrrhophrys Sclater, Contr. ornith., 1851, p. 89 (Colombia).

Tanagra (*Euphonia*) *prêtrei* (not *Tanagra pretrei* Lesson, 1839 = *Spindalis pretrei pretrei* (Lesson)) Lafresnaye, Rev. zool., 1843, p. 97 (Colombia).

Type.— M. C. Z. 76,905, Lafr. coll. 2,816.

Lafresnaye's name for the Blue-capped green tanager being clearly preoccupied by Lesson must give way to Sclater's later *Euphonia pyrrhophrys.*

TANAGRA AUREATA AUREATA Vieillot.

Tanagra aureata Vieillot, Enc. méth., 1823, **2**, p. 782 (Paraguay).

Pipra cyanocephala (not *Tanagra cyanocephala* P. L. S. Müller, 1776, = *Tangara cyanocephala cyanocephala* (P. L. S. Müll.)) Vieillot, Nouv. dict. hist. nat., 1818, **19**, p. 165 (Trinidad).

Tanagra nigricollis (not of Gmelin 1789) Vieillot, Nouv. dict. hist. nat., 1819, **32**, p. 412 (Brazil).

Tanagra chrysogaster Cuvier, Reger. avium, 1829, **1**, p. 366, ex. lindo bleue doré d'Azara (Paraguay).

Tanagra aureata Vieillot becomes the name by which this species must be known. We recognize three geographical races, as follows: —

1. TANAGRA AUREATA AUREATA Vieillot.

A large southern race, with darkest under parts — more chestnut or orange and palest blue crown. Range extending north to Bahia.

2. TANAGRA AUREATA INTERMEDIA (Chubb).

Euphonia nigricollis intermedia Chubb, Ibis, 1910, ser. 9, **4**, p. 624.

A smaller race, slightly paler below, with a slightly more purplish blue crown. Colombia, Venezuela, and Guiana.

3. TANAGRA AUREATA PELZELNI (Sclater).

Euphonia nigricollis pelzelni v. Berlepsch, Ms. Sclater, Cat. birds Brit. mus., 1886, **11**, p. 61.

A very distinct race, with yellow under parts (lacking the brownish or orange tinge present in the other two). Western Ecuador.

TANAGRA LAUTA LAUTA, nom. nov.

Euphonia hirundinacea (not *Tanagra hirundinacea* Lesson, Traité d'ornith., 1831, p. 460 = *Cypsnagra hirundinacea* (Lesson)), Bonaparte Proc. Zool. soc. London, 1837, p. 117 (Guatemala).

Since there is no name in synonymy available for Bonaparte's Euphonia, which ranges from Mexico to Nicaragua, we propose the above.

TANAGRA LAUTA PROBA, nom. nov.

Phonasca Gnatho (not *Tanagra gnatho* Lichtenstein, 1830 = *Saltator atriceps atriceps* Lesson) Cabanis, Journ. orn., 1860, p. 335 (Costa Rica).

The name by which the Costa Rican form has been known also proves to be untenable, and finding no other applied to it, we propose the above.

TANGARA HEINEI Cabanis.

Procnias heinei Cabanis, Mus. Hein., 1850, **1**, p. 31 (Colombia).

Tanagra (Aglaia) atricapilla (not *Tanagra atricapilla* Gmelin, 1789) Lafresnaye, Rev. zool., 1843, p. 290 (Colombia).

Type.— M. C. Z. 76,923, Lafr. coll. 2,931.

Since Lafresnaye's name for the Black-capped tanager is preoccupied by *Tanagra atricapilla* Gmel., we take for the species the only other name available in synonymy.

IRIDOSORNIS RUFIVERTEX RUFIVERTEX (Lafresnaye).

Arremon rufivertex Lafresnaye, Rev. zool., 1842, p. 335 excl. reference to Florent-Prévost (Bolivia).

Cotype.— M. C. Z. 76, 981, Lafr. coll. 2,951.

Cotype.— M. C. Z. 76,982, Lafr. coll. 2,950.

Tanagra dubusia Bonaparte, Consp. avium, 1850, **1**, p. 239 (Colombia).

In his original description of this tanager Lafresnaye referred to "Florent-Prévost. zool. du voy. de la VENUS," saying also "elle est figuré dans la voyage de la Vénus." This was a mistake. The bird Lafresnaye had in mind being *Tanagra ruficervix* Prévost and Des Murs (now *Tangara ruficervix* (Prévost and Des Murs)). Later Lafresnaye recognized his mistake in confusing his bird and Prévost's, and consistently referred to the bird described by himself as "Nob.," crossing out the reference to Prévost on the original label of his specimens. The cotypes of *Arremon rufivertex* Lafr. are thus Lafresnaye's own specimens having nothing to do with *Tanagra ruficervix* Prévost and Des Murs, and Lafresnaye's name must supplant Bonaparte's *dubusia* in current use for the species. With Lafresnaye's cotypes, original labels, and description before us, we believe this change of names correct. If, however, our disposition of names be considered erroneous, then the name Iridosornis Lesson must go. Lesson (Echo du Monde Savant, 1844, p. 80) in specifying the type of his genus states that — "Le type de ce genre, bien distinct dans la tribu des tangaras, a été décrit par M. Florent Prévost sous le nom d'*Arremon rufivertex* (*Zool. de la Vénus et Revue zool.*, 1842, p. 335)," evidently meaning Lafresnaye's bird and not *Tanagra ruficervix* Prévost and Des Murs. If, however, the type of the name *Arremon rufivertex* is not Lafresnaye's specimen, but Prévost's *Tanagra ruficervix*, the latter must also be the type of Lesson's genus Iridosornis! Poecilornis Hartlaub, 1844, would be untenable for exactly the same reason, and we should have to use Euthraupis Cabanis, 1850.

According to our views the three subspecies are:—

Iridosornis rufivertex rufivertex (Lafresnaye).

Iridosornis rufivertex ignicapillus Chapman.[1]

Iridosornis rufivertex caeruleoventris Chapman.[2]

TACHYPHONUS SURINAMUS BREVIPES Lafresnaye.

Tachyphonus brevipes Lafresnaye, Rev. zool., 1846, p. 206 (Colombia).

Cotype.— M. C. Z. 76,728, Lafr. coll. 3,100.

Cotype.— M. C. Z. 76,729, Lafr. coll. 3,101.

Tachyphonus napensis Lawrence, Ann. Lyc. nat. hist. N. Y., 1864, **8**, p. 42 (Rio Napo, East Ecuador).

Berlepsch, Rev. tanag. (Int. ornith. kongress, 1910, p. 1, 148), listed *Tachyphonus brevipes* Lafresnaye among undetermined species, suggesting that it might be the female of *Tachyphonus surinamus* (Linné).

The two cotypes of *T. brevipes* Lafr. are adult females. They are alike, each showing to a marked degree the ochraceous buff throat and breast characteristic of the female of the form we have been calling *T. surinamus napensis* Lawrence. The female of *T. surinamus surinamus* (Linné) has the throat and breast cream buff. Lafresnaye's specimens came from Colombia and the name *Tachyphonus surinamus brevipes* Lafr. must therefore replace *Tachyphonus surinamus napensis* Lawr.

CHLOROSPINGUS OPHTHALMICUS (Du Bus).

Arremon ophthalmicus Du Bus, Bull. Acad. Bruxelles, 1847, **14**, 2, p. 106 (Mexico).

Tachyphonus albitempora (not of authors) Lafresnaye, Rev. zool., 1848, p. 12 ("Habit in Colombia,"— error, we suggest Mexico).

Cotype.— M. C. Z. 77,050, Lafr. coll. 3,122.

Cotype.— M. C. Z. 77,051, Lafr. coll. 3,123.

---

[1] Bull. Amer. mus. nat. hist., 1915, **34**, p. 656.

[2] Loc. cit., p. 657.

Lafresnaye's two cotypes do not belong to the species with which his name *albitempora* has always been associated, but are perfectly characteristic examples of the Mexican *ophthalmicus* of Du Bus, and probably came from southeastern Mexico. In many instances Lafresnaye did not know whether his specimens were from Colombia or Mexico, and we find numerous labels written by him which say, "Colombie ou Mexique." At some date later than his description of *Tachyphonus albitempora*, Lafresnaye himself thought his bird identical with *Arremon ophthalmicus* and wrote a second label for his specimens to that effect.

Chapman (Bull. Amer. mus. nat. hist., 1917, **36**, p. 618) while working on the Colombian forms of Chlorospingus, appears to have been the first ornithologist of the present generation to detect the absolute discrepancy between Lafresnaye's description and the Colombian bird to which the name had universally been applied. He therefore named the Colombian form *Chlorospingus albitempora nigriceps*.

We suppose the type of *Chlorospingus flaviventris* Sclater is in the Museum of Cambridge University; it should be examined and compared because if, as supposed by Salvin, it represents what was known as *C. albitempora* Lafr., it bears the earliest date of any of the subspecies. Trinidad, whence it was supposed to come, is undoubtedly an error, and the subspecies to which it belongs must be proved before a new arrangement of the forms of this species can be made.

CNEMOSCOPUS, gen. nov.

Type.— *Arremon rubrirostris* Lafresnaye.

Characters. — Similar to Hemispingus in form and in shape of bill; legs much shorter — wing four and one quarter times the length of the tarsus (three and one half times in Hemispingus); coloration decidedly different from any of the species in the genus Hemispingus, the red bill, gray head, and yellowish green body being very distinctive. Except for the more slender, red bill, the general appearance suggests the genus Eucometis.

OSTINOPS DECUMANUS INSULARIS Dalmas.

In 1900 (Mem. Soc. zool. France, **13**, p. 137) Count Dalmas named the Great yellow-tail of Tobago, basing his separation upon the smaller size and paler castaneous rump of the island form. In 1906, Hellmayr (Nov. zool., 1906, **13**, p. 19) criticised Dalmas's form, and viewed the separation as a mistake, on the ground that the characters given by Dalmas were precisely those distinguishing the female from the male of the species, and suggested that the specimens seen by Dalmas were incorrectly marked as to sex.

In 1917 Todd (Proc. Biol. soc. Washington, **30**, p. 3), on the other hand, named the Colombian form *Ostinops decumanus melanterus* supposing the Colombian bird to be blacker than the Guianan. Chapman (Bull. Amer. mus. nat. hist., 1917, **36**, p. 24) has entirely disproved this, showing that there is no difference in color between Colombian and Guianan specimens. He, however, noticed the more chestnut tone of birds from Trinidad and the Paria Peninsula.

We have lately examined and compared a large series from the continent and from Trinidad and Tobago, and while we, like Chapman, cannot find any differences in specimens from Colombia and Guiana, we believe that the paler coloration and castaneous upper parts, especially the rump, of birds from Tobago, Trinidad, and the Paria Peninsula (the latter on Chapman's authority), are constant characters, and we therefore revive the name *Ostinops decumanus insularis* Dalmas.

Cissilopha sanblasiana sanblasiana (Lafresnaye).

Pica san-blasiana Lafr., Mag. zool., 1842, pl. 28 ("Elle vit en troupes selon M. Léclancher à Acapulco et à San-Blas sur la côte ouest du Mexique" — we select Acapulco).

Type.— M. C. Z. 76,202, Lafr. coll. 5,543. Acapulco.

Cissolopha pulchra Nelson, Auk, 1897, **14**, p. 56 (Acapulco, Guerrero, S. W. Mexico).

Although Lafresnaye, in naming this species, cited "Geai de San-Blas, Neboux, Rev. zool., 1840, p. 290, et 323," he described from his own specimen and even called attention to the fact that his bird was slightly different from Neboux's. Lafresnaye's bird, the type of the species, came from Acapulco as stated by Lafresnaye (Rev. zool. 1840, p. 323) in quoting Léclancher from whom he obtained it: "Cette Pie noire et bleue vient d'Acapulco."

Dr. E. W. Nelson, has redescribed this southern race, as *Cissolopha pulchra*, assuming the type-locality of *Pica sanblasiana* to be San Blas. Dr. Nelson has kindly lent us the type of *C. pulchra* and a long series of topotypes. These we have compared with more than fifty skins from Colima, Tepic, in M. C. Z.

Lafresnaye's type certainly represents the southern form, with the blue of a much more purplish shade than in any example from Colima. It is not quite so dark as Nelson's type, which is an extreme example, but compared with a series of topotypes it is an average specimen. The specimen was mounted and on exhibition, in direct light, in the Boston Society of Natural History for more than fifty years; it shows, however, but slight injury; the blue is perhaps a little dulled and the black has become somewhat brownish.

It is now obvious that *C. s. pulchra* Nelson is a synonym of *C. s. sanblasiana* (Lafresnaye). The northern form being without a name, we take pleasure in naming it in honor of Dr. Nelson.

CISSILOPHA SANBLASIANA NELSONI, subsp. nov.

Type.— M. C. Z. 65,111. Adult ♂. Mexico: Colima. 21 March, 1913. Gustav. Glückert.

Characters.— Similar to *C. s. sanblasiana* (Lafresnaye) of Acapulco, but smaller; upper parts bright cerulean blue instead of rich ultramarine or cyanine blue; under tail coverts and thighs dull ultramarine blue instead of cyanine blue.

Measurements.— *Type,* adult ♂; wing, 143.5; tail, 155; tarsus, 39; exposed culmen, 31.

Bulletin of the Museum of Comparative Zoölogy
AT HARVARD COLLEGE.
VOL. LXIII. No. 3.

THE ANTS OF BORNEO.

By William Morton Wheeler.

CAMBRIDGE, MASS., U. S. A.
PRINTED FOR THE MUSEUM.
July, 1919.

No. 3.— *The Ants of Borneo.*

By William Morton Wheeler.

CONTRIBUTIONS FROM THE ENTOMOLOGICAL LABORATORY OF THE BUSSEY INSTITUTION OF HARVARD UNIVERSITY, NO. 145.

During the past decade several collections of Bornean ants have been sent me for study and identification. Mr. John Hewitt sent an interesting lot of specimens accumulated during his residence in Kuching and Prof. Harrison W. Smith, of the Massachusetts Institute of Technology, made a collection in the same locality for the Museum of Comparative Zoölogy. He also contributed a number of specimens collected in British North Borneo by Mr. E. B. Kershaw, a clever young naturalist who lost his life in that country in a forest fire. Prof. Roland Thaxter of Harvard University gave me a number of small species from Sarawak, and Mr. Horace Donisthorpe kindly sent several that had been taken by Mr. G. E. Bryant on Mt. Matang, near Kuching. Recently a few additional specimens were received from Mr. William Beebe, of the New York Zoölogical Park.

While working up this material I found it necessary to prepare a complete list of the known Bornean Formicidae with their more important synonymy and distribution. During recent years less attention has been bestowed on the ants of Borneo than on those of Java, Sumatra, the Malay Peninsula, Burmah, and India. The Bornean fauna has, however, considerable historical interest to the taxonomist, because it has been studied by all the leading myrmecologists, Smith, Mayr, Ernest André, Emery, and Forel, and because the researches of several of these investigators were based on material secured by such well-known collectors and explorers as Alfred Russel Wallace, Doria, Beccari, Bedot, Pictet, and Chaper. Thus Borneo has come to be the type-locality for many interesting species later found to have a wide distribution in Indonesia. The material sent me by Hewitt and Harrison W. Smith is valuable because it was taken in the very localities in which Wallace collected. Professor Smith has given me the following notes in regard to some of these:

"*Scrambu* is the little mountain a few miles up country from Kuching, on the Sarawak River, where the first Rajah had his bungalow and where Wallace made the celebrated collection of moths to which he refers in "The Malayan Archipelago."

"*Rambungan River* is a small stream entering the sea about ten miles south of the Sarawak River. The specimens were taken about twelve miles from the coast.

"*Sadong* is the town on the Sadong River where the first coal mine was started.

"*Matang Mountain* is the beautiful mountain which one sees from Kuching."

The total number of species of which I have been able to make a record from Borneo is 256. I may have overlooked a few, owing to the widely scattered publication of the original descriptions and citations of localities. On the whole, the fauna has many forms in common with Sumatra, Java, and the Malay Peninsula, and additional exploration will no doubt greatly increase the number of such species. Quite a number of forms, however, seem to be peculiarly Bornean. The total number of genera is 59, distributed among the five subfamilies as follows: Ponerinae 18, Dorylinae 2, Myrmicinae 23, Dolichoderinae 4, Camponotinae 12. The following pages add some 58 species (indicated by an asterisk) to the known fauna, including 23 new to science.

The series of Bornean ant genera comprises several of ancient aspect, *e.g.*, Cerapachys, Phyracaces, Metapone, Acanthomyrmex, Calyptomyrmex, Rhopalothrix, Cataulacus, Myrmoteras, Aphomomyrmex, Oecophylla, Gesomyrmex, Dimorphomyrmex, and Echinopla. Some of these seem to be confined to the mountains of Borneo and to be represented also in the mountains of Burmah and the Philippines. One species, *Gesomyrmex chaperi*, is unusually interesting, as it is peculiar to Borneo. The genus was first described by Mayr in 1868 from the Baltic Amber, and many years elapsed before the living Bornean species was discovered by Ernest André (1892). In the same paper André described a species of Dimorphomyrmex from Borneo and three years later Emery recorded a fossil species from the Baltic Amber. Recently I described a second living species from the mountains of Luzon. It is probable, therefore, that careful exploration of the mountains of Borneo and the neighboring islands will bring to light other interesting relicts of the once very widely distributed Eocene ant-fauna.

Some of the Bornean ant-genera are very rich in species, *e.g.*, Crematogaster, which is remarkable also in comprising more numerous forms with 10-jointed antennae (subgen. Decacrema) and swollen epinotum (subgen. Physocrema) than occur in other regions. Leptogenys is represented by several large and handsome species of the subgenus Lobopelta, and Cataulacus, Dolichoderus (subgen. Hypoclinea), Polyrhachis, and Echinopla are also rich in species. All but three of the subgenera of Polyrhachis (Hagiomyrma, Hedomyrma, and Myrmatopa) are known to occur in the island. Of Camponotus the subgenera Myrmotarsus and Colobopsis are represented by numerous species, while most of the other subgenera are rather poorly represented, though often by peculiar forms (Myrmoturba, Myrmosphincta). Compared with the Philippines and the adjacent mainland, and especially with Papua and Australia, Borneo seems to possess few species of Pheidole and Monomorium, and many primitive ponerine genera have not been recorded from the island, *e.g.* Mystrium, Stigmatomma, Trapeziopelta, Prodiscothyrea, Cryptopone, and Centromyrmex. I believe, however, that some or all of these will be found in Borneo. Only recently I received species of Mystrium, Stigmatomma, Trapeziopelta, and Centromyrmex from the Philippines, where they were previously unknown. Of course, Borneo has been invaded by the usual tropicopolitan tramp species, *Monomorium pharaonis* and *floricola, Tetramorium guineense* and *simillimum, Pheidole megacephala, Triglyphothrix striatidens, Plagiolepis longipes,* and *Prenolepis longicòrnis,* and *obscura.*

FORMICIDAE: PONERINAE.

1. CERAPACHYS ANTENNATUS Smith.

Cerapachys antennatus Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 74, ☿; Emery, Ann. Mus. civ. Genova, 1887, ser. 2, **5**, p. 445, ♀, pl. 1, fig. 8, 9; Emery, Gen. Ins. Ponerinae, 1911, p. 9, ☿ ♀.

Type-locality: Sarawak, Borneo (A. R. Wallace).

Worker. Length 5.5 mm.

Head distinctly longer than broad, narrower in front than behind, with straight sides, broadly concave occipital border, acute occipital angles and convex dorsal surface, subtruncate behind. Eyes rather large, flattened, their anterior orbits at the middle of the head. There is a small shallow impression on the middle of the vertex. Occipital border marginate, the margination surrounding the corners and continued some distance along the ventral surface of the head. Gula with a pair of small, prominent teeth at its anterior margin. Mandibles rather large, triangular, strongly bent at the base, flattened, with straight lateral and broad, dentate apical borders. Clypeus extremely short and transverse. Frontal carinae prominent, vertical, approximated and rounded, confluent but not truncated behind in a depression continuous with the antennal foveae. In front between the carinae there is a small, acute, median tooth. Frontal groove absent. Cheeks with a strong carina, terminating anteriorly in a sharp, rectangular tooth or projection. Antennae short; scapes rapidly enlarging towards their apices, which reach back to a line connecting the anterior orbits; funiculi thick, all the joints except the last decidedly broader than long, joints 1–6 much broader than long, joints 7–10 subequal, somewhat longer, terminal joint very large, glandiform, as long as the four preceding joints together. Thorax narrower than the head, about 2½ times as long as broad, as broad through the epinotum as through the pronotum, narrowed in the mesoëpinotal region; with indistinct, slightly impressed mesoëpinotal suture. Pronotum subrectangular in front, its anterior and inferior borders strongly marginate. In profile the dorsal outline of the thorax is horizontal and very feebly convex. Epinotum from above a little longer than broad, rather rounded on the sides, its declivity sloping, slightly concave and strongly marginate above and on the sides. Petiole narrower than the epinotum, distinctly longer than broad, as broad in front as behind, with feebly rounded sides and dorsal surface, the former slightly carinate below; its ventral surface anteriorly with a prominent, compressed, triangular tooth. The anterior surface is strongly truncated and with a sharp carina above. Postpetiole a little longer than the petiole but distinctly broader, longer than broad and broader behind than in front, with evenly convex dorsal, ventral, and lateral surfaces, its anterior border strongly marginate, with sharply angular corners. Gaster elongate, first segment shaped like the postpetiole but larger; pygidium truncated and slightly concave above, bordered with numerous prominent spinules. Sting large. Legs with short tibiae, those of the middle and hind legs not longer than the metatarsi; hind coxae without a lamelliform expansion at the tip on the inner side.

Shining; mandibles opaque, striatopunctate; cheeks very coarsely rugose. Surface of the body with very sparse, coarse, piligerous punctures, longitudinally confluent on the dorsolateral surfaces of the petiole.

Hairs moderately long, bristly, erect, pale yellowish, sparse on the body, sparser on the scapes and legs. Pubescence absent, except on the funiculi tibiae, and tarsi.

Black; mandibles, funiculi, tarsi, tips and bases of scapes, femora, and tibiae, pygidium and sting deep red.

A single specimen from Kuching (John Hewitt).

I have redescribed this insect which is the type of the genus, as the worker has not been seen within recent years and because Smith's description is antiquated and incomplete. Emery described and figured a deälated female from Sumatra. Compared with his figures, the worker has the petiole distinctly longer and more narrowed in front, and the head is also narrower anteriorly.

2. CERAPACHYS DOHERTYI Emery.

Cerapachys dohertyi Emery, Rend. R. accad. sci. Bologna, 1901, p. 25, ☿ ; Emery, Gen. Ins. Ponerinae, 1911, p. 9, ☿ .

Type-locality: Pulo Laut, Borneo (W. Doherty).

3. CERAPACHYS PARVULUS Emery.

Cerapachys dohertyi var. *parvula* Emery, Rend. R. accad. sci. Bologna, 1901, p. 25, ☿ ; Emery, Gen. Ins. Ponerinae, 1911, p. 9.

Type-locality: Pulo Laut, Borneo (W. Doherty).

As Emery surmised, this is, in all probability, a distinct species and not a variety of *dohertyi*.

*4. CERAPACHYS BRYANTI, sp. nov.

Worker. Length 2 mm.

Head about ¼ longer than broad, a little broader behind than in front, with very feebly convex sides, broadly excised and marginate posterior border and sharp posterior angles. Eyes distinctly smaller than the greatest diameter of the scapes, their posterior orbits at the middle of the head. Cheeks with a prominently angled carina in front. Mandibles small, not flexed at the base, with feebly rounded lateral and very indistinctly denticulate apical borders. Frontal carinae prominent, erect, approximated, rounded, subtruncate, but not fusing behind. Frontal groove absent. Antennal scapes thick, about half as long as the head, joints 1–10 of the funiculus very short and transverse, terminal joint large, glandiform, as long as the six preceding joints together. Thorax narrower than the head, elongate, subrectangular, flattened above and on the sides, twice as long as broad, not broader behind than in front, slightly narrowed in the middle, without promesonotal or mesoëpinotal sutures. Anterior border of pronotum very straight and transverse, its superior and inferior borders as well as the superior and lateral borders of the abrupt epinotal declivity marginate. Petiole nearly square, very slightly broader behind than in front, narrower than the epinotum, truncated and sharply marginate in front, but not on the sides. Postpetiole shaped exactly like the petiole, but larger. Gaster formed very largely of the first segment, which has the same shape as the postpetiole but is somewhat larger. Terminal gastric segments small. Pygidium minutely and rather bluntly spinulate on the sides. Sting well-developed. Legs short and robust, hind coxae without a lamelliform enlargement at the tip on the inner side.

Shining; head, thorax, petiole, and postpetiole evenly covered with sparse, coarse umbilicate, piligerous punctures or foveolae, excepting the middorsal portion of the thorax, which is smooth and very shining. Gaster sparsely punctate, more finely than the more anterior regions, legs and scapes with sparser, finer punctures.

Hairs pale yellow, sparse, erect, bristly, of uneven length, less numerous on the appendages than on the body. Pubescence absent, except on the funiculi.

Castaneous; mandibles, antennae, pygidium, sting, and legs, excluding the coxae, red.

Described from a single specimen sent me by Mr. Horace Donisthorpe. It was taken by Mr. G. E. Bryant on Mt. Matang in West Sarawak.

This species has the appearance of a Syscia on account of its small size and the structure of the thorax and abdomen, but the antennae are 12-jointed as in Cerapachys *sens. str.* It is allied to *C. dohertyi* Emery and *parvula* Emery, but both of these forms are decidedly larger and have the petiole and postpetiole broader than long.

5. PHYRACACES PUBESCENS Emery.

Phyracaces pubescens Emery, Rend. R. accad. sci. Bologna, 1901, p. 26, ♀; Emery, Gen. Ins. Ponerinae, 1911, p. 11, ♀.

Type-locality: Pulo Laut, Borneo (W. Doherty).

*6. PHYRACACES HEWITTI, sp. nov.

Worker. Length 3.5 mm.

Head a little longer than broad, scarcely broader behind than in front, with feebly rounded sides, broadly excavated posterior border and sharp posterior corners, both strongly marginate. In profile the dorsal surface is moderately convex, subtruncate behind, the gular surface feebly convex. Eyes rather large, feebly convex, distinctly in front of the middle of the head. Mandibles triangular, strongly bent at the base, with nearly straight external and indistinctly denticulate apical borders. Frontal carinae approximated, erect, rounded, united but not truncated behind. Cheeks with a short, strong carina, terminating in front in an acute, rectangular tooth. Antennal scapes thickened towards their tips, which extend a little beyond the posterior orbits; funiculi rather long, joints 1–9 broader than long, joint 10 as long as broad, terminal joint as long as the two preceding joints together, somewhat tapering and not broader than the penultimate joint. Thorax slightly narrower than the head, distinctly broader through the epinotum than through the pronotum, less than twice as long as broad, without promesonotal and mesoëpinotal sutures. Pro- and mesonotum together rectangular, as long as broad; epinotum with rounded, rather swollen sides. In profile the whole thorax is feebly and evenly rounded above. Epinotal declivity abrupt, very strongly carinate above and on the sides, as is also the pronotum. Pleurae concave. Petiole as broad as the epinotum, rectangular, nearly 1½ times as broad as long, as broad in front as behind, feebly convex above, truncated anteriorly and posteriorly, with its anterior and lateral borders marginate and its posterior angles produced as a pair of triangular, rather acute teeth. Postpetiole rectangular, a little broader than long, as broad in front as behind and as broad as the petiole, feebly convex above, marginate in front, with sharp anterior corners, submarginate on the sides. First gastric segment a little larger than the postpetiole, as long as broad, with more convex sides and dorsum, ventrally, in front, with a conspicuous rounded tubercle. Pygidium truncate, with finely spinulate border. Legs rather short, hind coxae with a rounded expansion at the tip on the inner side.

Moderately shining; mandibles very sparsely and coarsely punctate; body finely punctate, dorsal surfaces of head and thorax also with irregular scattered foveolae; region between the eyes and frontal carinae smooth and shining. Sides of head and thorax also more shining and less punctate.

Hairs and pubescence grayish, the hairs rather short, sparse, erect, both on the body and appendages, longest and most abundant at the tip of the gaster, the pubescence rather long and abundant, especially on the petiole, postpetiole, gaster, legs, and antennae, but also well-developed on the thoracic dorsum and head.

Black; mandibles, antennae, legs, pygidium, and sting dark red, the middle portions of the scapes, femora, and tibiae somewhat darker.

Female. Length 4 mm.

Very similar to the worker. Thorax through the wing-insertions as broad as the head; mesonotum small, flat, a little broader than long, shaped like an isosceles triangle, with the apex directed anteriorly. Sculpture, pilosity, and color as in the worker. Wings yellowish hyaline, with pale yellow veins and conspicuous brown pterostigma.

Described from four workers and three females taken by Mr. John Hewitt at Kuching. *Type*.— M. C. Z. 8,945.

This species seems to be closely related to *Ph. pubescens* Emery, described from a deälated female, but *hewitti* is much smaller (*pubes-*

cens measures about 6 mm.); the epinotal declivity is very distinctly separated from the base by a pronounced margination or carina, the petiole, and postpetiole are much broader and the former has distinctly dentate posterior angles.

*7a. MYOPOPONE CASTANEA Smith subsp. MACULATA Roger.

Myopopone maculata Roger, Berl. ent. zeitschr., 1861, **5**, p. 50, ☿ ♀.
Myopopone castanea Forel, Journ. Bombay nat. hist. soc., 1900, **13**, p. 54, ☿ ♀; Bingham, Fauna Brit. India. Hymenop., 1903, **2**, p. 54.
Myopopone castanea subsp. *maculata* Emery, Gen. Ins. Ponerinae, 1911, p. 26.

Type-locality: Ceylon (☿) and Bintang Island (♀).

A single female from Kuching (John Hewitt), though measuring only 12.5 mm., agrees in all other respects with females from the Philippines. The tibiae are not spotted. The species has not been recorded from Borneo, though well known from other parts of the Malayan and Papuan regions.

*8. PLATYTHYREA PUSILLA Emery.

Platythyrea pusilla Emery, Rev. Suisse zool., 1893, **1**, p. 188, ☿; Emery, Gen. Ins. Ponerinae, 1911, p. 29, ☿.

Type-locality: Amboina.

A single deälated female from Kuching (John Hewitt) agrees well with Emery's description of the worker. It measures only 5 mm.

9. PLATYTHYREA SUBTILIS Emery.

Platythyrea subtilis Emery, Ann. Mus. civ. Genova, 1900, ser. 2, **20**, p. 666, *nota* ☿; Emery, Gen. Ins. Ponerinae, 1911, p. 29, ☿.

Type-locality: Pulo Laut, Borneo (Doherty).

10. STICTOPONERA BORNEËNSIS Emery.

Ectatomma coxale Mayr, Ann. Mus. civ. Genova, 1872, **2**, p. 150, ☿ (*nec* Roger).
Stictoponera borneënsis Emery, ibid., 1900, ser. 2, **20**, p. 662 *nota*, ☿; Emery, Gen. Ins. Ponerinae, 1911, p. 47, ☿.

Type-locality: Sarawak, Borneo.

Two workers from Kuching (John Hewitt).

11a. Stictoponera costata Emery var. unicolor Forel.

Stictoponera costata var. *unicolor* Forel, Rev. Suisse zool., 1901, **9**, p. 335, ☿; Emery, Gen. Ins. Ponerinae, 1911, p. 48, ☿.

Type-locality: Sarawak, Borneo (Haviland).

12. Stictoponera coxalis (Roger).

Ponera coxalis Roger, Berl. ent. zeitschr., 1860, **4**, p. 308, ☿.
Ectatomma coxale Emery, Ann. Mus. civ. Genova, 1887, ser. 2, **5**, p. 444.
Stictoponera coxalis Emery, ibid., 1900, ser. 2, **20**, p. 662; Emery, Gen. Ins. Ponerinae, 1911, p. 48.
Ectatomma (*Stictoponera*) *coxale* Bingham, Fauna Brit. India. Hymenop., 1903, **2**, p. 81, ☿, fig. 44.

Type-locality: Ceylon (H. Nietner).
Sarawak (Doria and Beccari).

13. Stictoponera menadensis Mayr.

Ectatomma (*Stictoponera*) *menadensis* Mayr. Verh. Zool. bot. gesellsch. Wien, 1887, **37**, p. 539 *nota* ☿.
Stictoponera menadensis Emery, Ann. Mus. civ. Genova, 1900, ser. 2, **20**, p. 663; Emery, Gen. Ins. Ponerinae, 1911, p. 48, ☿.

Type-locality: Menado, Celebes (Radoszkowski).
Borneo.

A worker, which agrees very closely with Mayr's description, and three males from Kuching (John Hewitt). I refrain from describing the latter, as I am not certain that they belong with the worker.

14. Stictoponera rugosa (Smith).

Ponera rugosa Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 66, ☿.
Stictoponera rugosa Emery, Gen. Ins. Ponerinae, 1911, p. 48, ☿.

Type-locality: Sarawak, Borneo (A. R. Wallace).

15. Rhopalopone diehli (Forel).

Ectatomma (*Mictoponera*) *diehli* Forel, Ann. Soc. ent. Belgique, 1901, **45**, p. 372, ☿.

Rhopalopone diehli Emery, Gen. Ins. Ponerinae, 1911, p. 35, ☿.

Type-locality: Sarawak, Borneo (Haviland).

16. Odontoponera transversa (Smith).

Ponera transversa Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 68, ☿; Smith, Cat. Hymenop. Brit. mus., 1858, **6**, p. 86, ☿.

Ponera denticulata Smith, ibid., p. 90, ♀, pl. 6, fig. 13, 14.

Odontoponera denticulata Mayr, Verh. Zool. bot. gesellsch. Wien, 1862, **12**, p. 717.

Odontoponera transversa Dalla Torre, Cat. Hymenop., 1893, **7**, p. 30; Emery, Gen. Ins. Ponerinae, 1911, p. 60.

Type-locality: Singapore (A. R. Wallace).

Sarawak (Doria and Beccari).

Several specimens from Kuching (John Hewitt), Rambungan River, Sarawak (H. W. Smith) and British North Borneo (E. B. Kershaw). These and a series of specimens taken at Surubaya, Java, by H. W. Smith and by F. X. Williams in the Philippines vary considerably in size. Rather pronounced differences in color have also been noted by other authors, but no attempt has been made to name varieties.

17. Diacamma holosericeum (Roger).

Ponera holoserica Roger, Berl. ent. zeitschr., 1860, **4**, p. 302, ☿.

Diacamma holosericeum Mayr, Ann. Mus. civ. Genova, 1872, **2**, p. 149, ☿; Emery, ibid., 1887, ser. 2, **5**, p. 435, ☿; Emery, Gen. Ins. Ponerinae, 1911, p. 65.

Type-locality: Java.

Sarawak (Doria and Beccari).

18. Diacamma intricatum (Smith).

Ponera intricata Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 67, ☿.

Diacamma intricatum Mayr, Ann. Mus. civ. Genova, 1872, **2**, p. 149; Emery, Gen. Ins. Ponerinae, 1911, p. 65.

Type-locality: Sarawak, Borneo (A. R. Wallace).

Sarawak (J. Doria and O. Beccari); Kapouas Basin (Chaper); Central Borneo (Munich Museum).

Several workers taken at Kuching by John Hewitt and H. W. Smith and by the latter at Sadong, Serambu Mt., and Rambungan River, Sarawak.

*18a. DIACAMMA INTRICATUM subsp. KERSHAWI, subsp. nov.

Worker. Length about 11 mm.

Smaller than the typical *intricatum*, with smaller eyes, less pronounced clypeal carina, the petiole narrower anteriorly, and the striae on the upper surface of the petiole and first gastric segment almost obliterated. The second gastric segment is faintly, but distinctly, longitudinally striated in the middle above, and the whole gaster is more opaque and more densely punctate. The pilosity on the body and legs is slightly more abundant than in the typical form.

A single specimen taken by Mr. E. B. Kershaw in British North Borneo. *Type.*—M. C. Z. 9,073.

19. DIACAMMA RUGOSUM (Le Guillou).

Ponera rugosa Le Guillou, Ann. Soc. ent. France, 1840, **10**, p. 318, ☿.
Ponera versicolor Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 65, ☿.
Diacamma rugosum Mayr, Ann. Mus. civ. Genova, 1872, **2**, p. 149, ☿; Emery, Gen. Ins. Ponerinae, 1911, p. 66.
Diacamma geometricum subsp. *versicolor* Emery, Rev. Suisse zool., 1893, **1**, p. 189; Emery, Ann. Mus. civ. Genova, 1887, ser. 2, **5**, p. 438.

Type-locality: Borneo. (Voyage of the "Astrolabe" and "Zelée").

Sarawak (Doria and Beccari; Bedot and Pictet; A. R. Wallace).

Eleven workers from Sadong, Sarawak (H. W. Smith) and two from Kuching (John Hewitt) agree with Emery's redescription of this species. They lack metallic reflections, however.

19a. DIACAMMA RUGOSUM subsp. TORTUOLOSUM (Smith).

Ponera tortuolosa Smith, Journ. Proc. Linn. soc. London. Zool., 1863, **7**, p. 18, ☿.
Diacamma tortuolosum Forel, Mitth. Naturh. mus. Hamburg, 1901, **18**, p. 46, ☿.

Diacamma rugosum subsp. *tortuolosum* Emery, Rend. R. accad. sci. Bologna, 1897, 1896–97, n. s., **1**, p. 160; Emery, Gen. Ins. Ponerinae, 1911, p. 67.

Type-locality: Ceram (A. R. Wallace).

Tandjong, S. E. Borneo (Fritz Suck).

19b. DIACAMMA RUGOSUM subsp. GEOMETRICUM (Smith).

Ponera geometrica Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 67, ☿.

Diacamma geometricum Mayr, Verh. Zool. bot. gesellsch. Wien, 1862, **12**, p. 718, ☿.

Diacamma javanum Emery, Ann. Mus. civ. Genova, 1887, ser. 2, **5**, p. 439, ☿.

Diacamma rugosum subsp. *geometricum* Emery, Rend. R. accad. sci. Bologna, 1897, 1896–97, n. s., **1**, p. 154, fig. 3, 8, 14, ☿; Emery, Gen. Ins. Ponerinae, 1911, p. 66, ☿.

Type-locality: Singapore (A. R. Wallace).

Banguey I., N. Borneo (Emery).

A worker and two males taken in British North Borneo (E. B. Kershaw). The male measures 8 mm., and is ferruginous red, with the posterior part of the head and some indistinct spots on the mesonotum dark brown. Wings slightly infuscated, with dark brown veins and pterostigma. Antennae very long (7 mm.), mandibles small, narrow, edentate, with acuminate, pointed tips. Petiole $1\frac{1}{4}$ times as long as broad, narrowed in front, but with very prominent stigmatic tubercles; in profile about as long as high, triangular, with sloping, slightly concave anterior and abrupt posterior surface and blunt apex. Pygidium small, bluntly rounded, cerci well-developed; genitalia partially exserted. Body shining, sparsely and finely punctate. Hairs brown, short, rather abundant, pubescence pale, more abundant, and like the hairs, on all parts of the body.

19c. DIACAMMA RUGOSUM subsp. VAGANS Smith var. BIRMANUM Emery.

Diacamma rugosum subsp. *vagans* var. *birmana* Emery. Ann. Mus. civ. Genova, 1887, ser. 2, **5**, p. 441, ☿; Emery, Gen. Ins. Ponerinae, 1911, p. 67; Forel, Rev. Suisse zool., 1911, **19**, p. 23.

Diacamma rugosum subsp. *sculptum* var. *birmana* Emery, Rend. R. accad. sci. Bologna, 1897, 1896–97, n. s. **1**, p. 157, ☿.

Type-locality: Minhla, Burmah (Comotto).

Sarawak (Haviland).

20a. BOTHROPONERA INSULARIS Emery var. BREVIOR Forel.

Pachycondyla (*Bothroponera*) *insularis* v. *brevior* Forel, Mitth. Naturh. mus. Hamburg, 1901, **18**, p. 45, ☿; Emery, Gen. Ins. Ponerinae, 1911, p. 76.

Type-locality: Borneo.

21. BOTHROPONERA RUFIPES (Jerdon).

Ponera rufipes Jerdon, Ann. mag. nat. hist., 1854, ser. 2, **13**, p. 102, ☿.
Pachycondyla rufipes Smith, Cat. Hymenop. Brit. mus., 1858, **6**, p. 106, ☿.
Bothroponera rufipes Mayr, Verh. Zool. bot. gesellsch. Wien, 1886, **36**, p. 359; Ern. André, Mém. Soc. zool. France, 1892, **5**, p. 53, ☿.
Ponera (*Bothroponera*) *rufipes* Forel, Journ. Bombay nat. hist. soc., 1900, **13**, p. 323.
Pachycondyla (*Bothroponera*) *rufipes* Emery, Gen. Ins. Ponerinae, 1911, p. 76.

Type-locality: Malabar, Southern India (Jerdon).
Kapouas Basin, Borneo (Chaper).

22. BOTHROPONERA TRIDENTATA (Smith).

Pachycondyla tridentata Smith, Cat. Hymenop. Brit. mus. 1858, **6**, p. 106, ☿.
Bothroponera tridentata Mayr, Ann. Mus. civ. Genova, 1872, **2**, p. 149; Emery, ibid., 1887, ser. 2, **5**, p. 442, ☿.
Pachycondyla (*Bothroponera*) *tridentata* Emery, Gen. Ins. Ponerinae, 1911, p. 77.

Type-locality: Sarawak, Borneo.
Sarawak (Doria and Beccari).

23a. BOTHROPONERA TRIDENTATA subsp. DEBILIOR Forel.

Pachycondyla (*Bothroponera*) *tridentata* subsp. *debilior* Forel, Mitth. Naturh. mus. Hamburg, 1901, **18**, p. 46, ☿; Emery, Gen. Ins. Ponerinae, 1911, p. 77, ☿.

Type-locality: Tandjong, S. E. Borneo (Fritz Suck).

24. ECTOMOMYRMEX OBTUSUS (Emery).

Pachycondyla (*Bothroponera*) *obtusa* Emery, Ann. Mus. civ. Genova, 1900, ser. 2, **20**, p. 667 *nota* ☿.

Pachycondyla (*Ectomomyrmex*) *obtusa* Emery, Gen. Ins. Ponerinae, 1911, p. 79, ☿.

Type-locality: Pulo Laut, Borneo (W. Doherty).

25. EUPONERA (BRACHYPONERA) LUTEIPES (Mayr).

Ponera luteipes Mayr, Verh. Zool. bot. gesellsch. Wien, 1862, **12**, p. 722, ☿ ♀; Forel, Journ. Bombay, nat. hist. soc., 1900, **13**, p. 326, ☿ ♀ ♂.
Euponera (*Brachyponera*) *luteipes* Emery, Ann. Soc. ent. Belgique, 1901, **45**, p. 47; Emery, Gen. Ins. Ponerinae, 1911, p. 84.
Brachyponera luteipes Bingham, Fauna Brit. India. Hymenop., 1903, **2**, p. 101, ☿ ♀ ♂.

Type-locality: Milu, Nicobar Islands (Novara Expedition).
Sarawak (Haviland).

26a. EUPONERA (TRACHYMESOPUS) DARWINI Forel var. INDICA Emery.

Euponera (*Pseudoponera*) *darwini* var. *indica* Emery, Bull. Soc. ent. Ital., 1900, **31**, p. 268 *nota*, ♀.
Pseudoponera darwini Bingham, Fauna Brit. India. Hymenop., 1903, **2**, p. 93.
Euponera (*Trachymesopus*) *darwini* var. *indica* Emery, Gen. Ins. Ponerinae, 1911, p. 86.

Type-locality: Upper Burmah (Doherty).
Sarawak (Haviland, Will).

27. PONERA TRUNCATA Smith.

Ponera truncata Smith, Journ. Proc. Linn. soc. London. Zool. Suppl., 1860, **4**, p. 72, ♀; Mayr, Ann. Mus. civ. Genova, 1872, **2**, p. 150, ♀; Emery, Gen. Ins. Ponerinae, 1911, p. 92, ♀.

Type-locality: Celebes.
Sarawak (Doria and Beccari).

Two deälated females from Sarawak (H. W. Smith) seem to be referable to this species, but are only 3–3.5 mm. long, whereas the dimensions of the female cotypes are given by Mayr as 4–4.2 mm. My specimens may represent a distinct variety or subspecies, but it seems inadvisable to introduce another name on the basis of such meager material.

*28. PONERA GLEADOWI Forel.

Poneragleadowi Forel, in Emery, Mem. R. accad. sci. Bologna, 1896, 1895–1896, ser. 5, **5**, p. 292 *nota* ☿; Emery, ibid., p. 297, fig. 17a, b, c; Bingham, Fauna Brit. India. Hymenop., 1903, **2**, p. 91; Emery, Gen. Ins. Ponerinae, 1911, p. 91.

Type-locality: Poona, India (Wroughton).

Two workers from Sarawak (H. W. Smith) agree very closely with a typical specimen from Orissa received from Professor Forel. The species has a wide distribution, occurring as far north and west as Algeria.

*29a. PONERA CONFINIS Roger var. JAVANA Forel.

Ponera confinis var. *javana* Forel, Mitth. Naturh. mus. Hamburg, 1905, **22**, p. 6, ☿ ♀; Emery, Gen. Ins. Ponerinae, 1911, p. 90, ☿ ♀.

Type-locality: Buitenzorg, Java (K. Kraepelin).

Seven workers and two females from Kuching (John Hewitt) agree well with a specimen from Singapore given me by Forel, with the description of specimens from Buitenzorg and with a worker taken by H. W. Smith at Surubaya, Java.

30. LEPTOGENYS (LOBOPELTA) CHALYBEA Emery.

Lobopelta iridescens Mayr, Ann. Mus. civ. Genova, 1872, **2**, p. 150, ☿; Mayr, Verh. Zool. bot. gesellsch. Wien, 1878, **28**, p. 665, ☿ (*nec* Smith).
Lobopelta chalybea Emery, Ann. Mus. civ. Genova, 1887, ser. 2, **5**, p. 432, ☿.
Leptogenys (*Lobopelta*) *chalybea* Emery, Gen. Ins. Ponerinae, 1911, p. 102, ☿.

Type-locality: Sarawak, Borneo (Doria and Beccari).

Four workers from Kuching (John Hewitt).

31. LEPTOGENYS (LOBOPELTA) IRIDESCENS (Smith).

Ponera iridescens Smith, Journ. Proc. Linn. Soc. London. Zool., 1857, **2**, p. 66, ☿.
Lobopelta iridescens Emery, Ann. Mus. civ. Genova, 1887, ser. 2, **5**, p. 431, ☿.
Leptogenys (*Lobopelta*) *iridescens* Emery, Gen. Ins. Ponerinae, 1911, p. 104, ☿.

Type-locality: Sarawak, Borneo (A. R. Wallace).

Sarawak (Doria and Beccari, Haviland).

A dozen workers from Kuching (H. W. Smith).

31a. LEPTOGENYS (LOBOPELTA) IRIDESCENS subsp. CURRENS Forel.

Leptogenys (Lobopelta) iridescens subsp. *currens* Forel, Rev. Suisse zool., 1901, **9**, p. 329, ☿ ; Emery, Gen. Ins. Ponerinae, 1911, p. 104, ☿ .

Type-locality: Sarawak, Borneo (Haviland).

32. LEPTOGENYS (LOBOPELTA) MUTABILIS (Smith).

Ponera mutabilis Smith, Journ. Proc. Linn. Soc. London. Zool., 1861, **6**, p. 45, ☿ .
Lobopelta mutabilis Mayr, Tijdschr. ent. 1867, **10**, p. 89; Emery, Ann. Mus. civ. Genova, 1887, ser. 2, **5**, p. 30, ☿ .
Leptogenys (Lobopelta) mutabilis Emery, Gen. Ins. Ponerinae, 1911, p. 104.

Type-locality: Tondano, Celebes (A. R. Wallace).
Sarawak, Borneo (Doria and Beccari; Bedot and Pictet).
Eleven workers from British North Borneo (E. B. Kershaw) and two from Kuching (H. W. Smith).

33a. LEPTOGENYS (LOBOPELTA) PROCESSIONALIS Jerdon var. DISTINGUENDA Emery.

Lobopelta distinguenda Emery, Ann. Mus. civ. Genova, 1887, ser. 2, **5**, p. 430, ☿ .
Lobopelta mutabilis (part) Mayr, ibid., 1872, **2**, p. 151, ☿ .
Leptogenys (Lobopelta) ocellifera subsp. *distinguenda* Forel, Mitth. Naturh. mus. Hamburg, 1901, **18**, p. 46, ☿ .
Leptogenys (Lobopelta) processionalis var. *distinguenda* Emery, Gen. Ins. Ponerinae, 1911, p. 104.

Type-locality: Sarawak, Borneo (Doria and Beccari).
Tandjong, S. E. Borneo (Fritz Suck).
Two dozen workers from Kuching (H. W. Smith).

34. LEPTOGENYS (LOBOPELTA) DIMINUTA (Smith).

Ponera diminuta Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 69, ☿ .
Lobopelta diminuta Mayr, Verh. Zool. bot. gesellsch. Wien, 1862, **12**, p. 734, ☿ .
Leptogenys diminuta Forel, Journ. Bombay nat. hist. soc., 1900, **13**, p. 312.
Leptogenys (Lobopelta) diminuta Emery, Gen. Ins. Ponerinae, 1911, p. 103.

Type-locality: Sarawak, Borneo (A. R. Wallace).
S. E. Borneo (Fritz Suck).

34a. LEPTOGENYS (LOBOPELTA) DIMINUTA var. LAEVICEPS (Smith).

Ponera laeviceps Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 69, ☿.
Ponera simillima Smith, ibid., 1861, **5**, p. 105, ☿.
Lobopelta diminuta var. *laeviceps* Emery, Ann. Mus. civ. Genova, 1887, ser. 2, **5**, p. 433, ☿.
Leptogenys (*Lobopelta*) *diminuta* var. *laeviceps* Emery, Gen. Ins. Ponerinae, 1911, p. 103.

Type-locality: Sarawak, Borneo (A. R. Wallace).
Two workers from Kuching (John Hewitt).

*35. LEPTOGENYS (LOBOPELTA) BORNEËNSIS, sp. nov.

Worker. Length: 9 mm.

Long and slender. Head about $\frac{1}{5}$ longer than broad, a little broader in front than behind, with nearly straight sides in front, rounded behind, with rather deeply excavated occipital border. Eyes rather small, situated a distance equal to their length from the anterior corners of the head. Mandibles rather large, triangular, with deflected tips, distinctly concave lateral, dentate apical and denticulate basal borders. Clypeus strongly carinate, its anterior border entire, projecting as a membranous, rather narrowly rounded lobe. Antennae long and slender; scapes extending about $\frac{1}{4}$ their length beyond the posterior corners of the head; all the funicular joints much longer than broad; first joint a little more than half as long as the second, second slightly longer than the third. Thorax long and slender. Pronotum slightly flattened above, longer than broad, mesonotum shorter and much narrower and lower than the pronotum, its dorsal outline very feebly concave; epinotum scarcely broader than the mesonotum, but very distinctly higher and longer, the base straight and horizontal, twice as long as the vertical declivity into which it passes through a curve without any trace of an angle. The sides of the declivity are feebly marginate. Each epinotal stigma is situated in a sharply defined elliptical depression. Petiole from above fully twice as long as broad, narrowed in front, laterally compressed. In profile the node is longer than high, its anterior border long and convex, the posterior border straight, the apex blunt, the ventral surface of the petiole sinuous in the middle. Gaster small. Legs long and slender.

Shining, very sparsely and very finely punctate; mandibles very finely and densely striate.

Hairs whitish, short, sparse, and erect on the body, more abundant and more oblique on the appendages. Pubescence pale, present only on the funiculi and tarsi.

Castaneous; mandibles, clypeus, legs including coxae, neck, prosterna petiole and tip of gaster, red; posterior margins of gastric segments yellowish.

Described from a single specimen taken at Kuching by Mr. John Hewitt.

This species has much the same color as *iridescens* apart from the blue reflections, but the shape of the node and thorax serve to distinguish it at once.

36a. LEPTOGENYS (LOBOPELTA) KITTELI Mayr subsp. LAEVIS Mayr.

Lobopelta kitteli var. *laevis* Mayr, Verh. Zool. bot. gesellsch. Wien, 1878, **28**, p. 665, ☿.
Leptogenys (*Lobopelta*) *kitteli* subsp. *laevis* Forel, Rev. Suisse zool., 1901, **9**, p. 329, ☿; Emery, Gen. Ins. Ponerinae, 1911, p. 104.

Type-locality: Java.
Sarawak (Haviland).

37. ODONTOMACHUS HAEMATODA (Linné).

Formica haematoda Linné, Syst. nat., ed. 10, 1758, p. 582, ☿.
Myrmecia unispinosa Fabricius, Syst. Piez., 1804, p. 423, ☿.
Myrmecia haematoda Fabricius, Syst. Piez., 1804, p. 423, ☿.
Odontomachus haematodes Latreille, Hist. nat. Crust. Ins., 1805, **13**, p. 257.
Ponera (*Odontomachus*) *haematoda* Latreille, ibid., 1809, **4**, p. 128, ☿.
Odontomachus haematoda Dalla Torre, Cat. Hymenop., 1893, **7**, p. 50; Emery, Gen. Ins. Ponerinae, 1911, p. 114, pl. 3, fig. 18, ☿ ♀ ♂.
Formica maxillosa DeGeer, Mem. hist. ins., 1773, **3**, p. 601, ☿, pl. 31, fig. 3–5.
Formica unispinosa Fabricius, Ent. syst., 1793, **2**, p. 359, ☿.
Odontomachus simillimus Smith, Cat. Hymenop. Brit. mus., 1858, **6**, p. 80, pl. 5, fig. 8, 9.

Type-locality: South America (Rolander).
Sarawak (Doria and Beccari), Kapouas Basin (Chaper).
Two workers from Kuching (John Hewitt).

38. ODONTOMACHUS RIXOSUS Smith.

Odontomachus rixosus Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 67, ☿; Emery, Gen. Ins. Ponerinae, 1911, p. 114.

Type-locality: Singapore (A. R. Wallace).

Sarawak (J. Doria and O. Beccari); Kapouas Basin (Chaper).
A dozen workers from Kuching (H. W. Smith).

39. ODONTOMACHUS MALIGNUS Smith.

Odontomachus malignus Smith, Journ. Proc. Linn. soc. London. Zool., 1859, **3**, p. 144, ☿ ; Emery, Gen. Ins. Ponerinae, 1911, p. 113.
Odontomachus tuberculatus Roger, Berl. ent. zeitschr., 1861, **5**, p. 28, ☿ ; Mayr, Ann. Mus. civ. Genova, 1872, **2**, p. 149, ☿ .

Type-locality: Aru (A. R. Wallace).
Sarawak, Borneo (Doria and Beccari).

40. ANOCHETUS AGILIS Emery.

Anochetus agilis Emery, Ann. Soc. ent. Belgique, 1901, **45**, p. 53, ☿ ; Emery, Gen. Ins. Ponerinae, 1911, p. 108.

Type-locality: Banguey, Borneo (Staudinger and Bang-Haas).

DORYLINAE.

41. DORYLUS (DICHTHADIA) LAEVIGATUS (Smith).

Typhlopone laevigatus Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 70, ☿ .
Dichthadia glaberrima Gerstäcker, Stettin. ent. zeit., 1863, **24**, p. 93, ♀ .
Dorylus klugi Emery, Ann. Mus. civ. Genova, 1887, ser. 2, **5**, p. 448, pl. 1, fig. 10, ♂.
Dorylus laevigatus Emery, Zool. jahrb. Syst., 1895, **8**, p. 729, ☿ .
Dorylus (*Dichthadia*) *laevigatus* Emery, Gen. Ins. Dorylinae, 1910, p. 8, ☿ ♀ ♂.

Type-locality: Sarawak, Borneo (A. R. Wallace).
Sarawak (Doria and Beccari).
Two large workers from Kuching (John Hewitt).

42. AENICTUS LAEVICEPS (Smith).

Typhlatta laeviceps Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 79, ☿ .
Aenictus laeviceps Forel, Ann. Soc. ent. Belgique, 1890, **34**, C. R., p. CII, ☿ ; Emery, Gen. Ins. Dorylinae, 1910, p. 30, ☿ .

Type-locality: Sarawak, Borneo (A. R. Wallace).
Sarawak (Doria and Beccari).
Five workers from Bongo Mt., Borneo (Hewitt and Brooks).

43. AENICTUS GRACILIS Emery.

Aenictus gracilis Emery, Rev. Suisse zool., 1893, **1**, p. 187, ☿; Emery, Gen. Ins. Dorylinae, 1910, p. 30, ☿.

Type-locality: Sarawak (Bedot and Pictet).

44. AENICTUS CORNUTUS Forel.

Aenictus cornutus Forel, Ann. Soc. ent. Belgique, 1900, **44**, p. 75, ☿; Emery, Gen. Ins. Dorylinae, 1910, p. 29, ☿.

Type-locality: Sarawak (Haviland).
A single worker from Kuching (John Hewitt).

45. AENICTUS PUNCTIVENTRIS Emery.

Aenictus punctiventris Emery, Bull. Soc. ent. Ital., 1901, **33**, p. 47, ♂; Emery, Gen. Ins. Dorylinae, 1910, p. 31, ♂.

Type-locality: Borneo.
A single worker from Kuching (John Hewitt).

46. AENICTUS AITKENI Forel.

Aenictus aitkeni Forel, Journ. Bombay nat. hist. soc. 1901, **13**, p. 465, 475, ☿; Bingham, Fauna Brit. India. Hymenop., 1903, **2**, p. 19, fig. 18, ☿; Emery, Gen. Ins. Dorylinae, 1910, p. 29, ☿.

Type-locality: Kanara, India (Aitken).
Sixteen workers from Kuching (H. W. Smith).

MYRMICINAE.

*47. METAPONE HEWITTI, sp. nov.

Male. Length 6–7 mm.

Body long and slender. Head as broad as long, evenly convex and rounded behind, without posterior corners; cheeks very short; eyes moderately large, but not very convex; ocelli rather small. Mandibles small, but well-developed, their external borders slightly sinuate towards the base, convex at the tips; apical and basal borders distinct, subequal, the former with four subequal teeth. Clypeus large, convex, somewhat broader than long, slightly depressed or flattened posteriorly. Front truncated anteriorly, with a transverse crest or carina separating it from the preocellar space and connecting the frontal carinae, which are prominent, nearly straight, subparallel and as far apart as they are from the lateral borders of the head. Posteriorly each carina curves forward medially to the eye as a distinct ridge and terminates opposite its anterior end, thus enclosing a small, shallow, elliptical scrobe about the base of the antenna. Antennae 12-jointed, scape very small, about twice as long as broad, first funicular joint also very small, broader than long, subglobular; second joint longer but also broader than long, the remaining nine joints cylindrical, of equal breadth, distinctly longer than broad and gradually increasing in length distally; terminal joint nearly as long as the two preceding joints together, with tapering and somewhat pointed tip. Thorax long, narrower than the head through the eyes. Pronotum well-developed, truncated in front; mesonotum and scutellum somewhat flattened above, the former with distinct Mayrian furrows, the latter with a peculiar blunt, spatulate spine on each side, slightly curved inward at its tip. Epinotum longer than broad, subrectangular from above, its base horizontal and twice as long as the vertical declivity into which it passes through an abrupt curve, the sides of the declivity above and of the base coarsely and rather irregularly marginate. Petiole with a short, stout peduncle anteriorly and a thick, cuboidal node, which is a little longer than broad and slightly higher in front than behind, with truncated anterior and posterior and feebly rounded dorsal and lateral surfaces. Seen in profile its ventral margin is slightly bisinuate, with a small, triangular tooth at the anterior end of the peduncle. Postpetiole distinctly broader than the petiole and broader than long, from above transversely elliptical, in profile slightly truncated anteriorly, convex and rounded above, its ventral border unarmed, nearly straight. Gaster elongate elliptical, with straight anterior border and tapering tip. Genitalia completely retracted, cerci apparently absent; pygidium and hypopygium short and pointed. Legs short, of the usual simple form, without the tibial spines of the worker and female; spurs of the middle and hind tibiae simple, blunt at the tip. Tarsal claws very small, strongly curved, nonpectinated. Wings very short (4.5 mm.), with a well-developed discoidal cell, a single cubital cell and the radial cell slightly open at the tip. The radial cell is large. Pterostigma well-developed and conspicuous.

Subopaque; mandibles opaque, longitudinally rugose and very finely punctate. Head reticulate-rugose, the clypeus more coarsely and transversely. Front behind its anterior truncation with regular longitudinal rugae converging to the anterior ocellus. Antennal scrobes less distinctly longitudinally rugose. Upper surface of mesonotum and scutellum and sides of thorax sharply and regularly longitudinally rugose, with elongate, shallow foveolae in the narrow interrugal spaces on the mesonotum. Dorsal surface of epinotum, including the upper portion of the declivity, with extremely coarse reticulate rugae, some of which are clearly transverse. Petiole above less coarsely and even more irregularly rugose. Postpetiole and gaster very finely and densely punctate, with superimposed small, sparse, and very regular piligerous punctures.

Hairs grayish brown, short, rather abundant, erect on the head, thorax, and petiole, mostly subappressed or oblique on the postpetiole, gaster, and legs. Antennal funiculi with very short, fine hairs, or pubescence. Wings minutely hairy.

Black; mandibles, antennae, legs, and tip of gaster reddish brown, the tarsi slightly paler. Wings grayish hyaline, with slightly infuscated tips and anterior margin; veins sharply defined, brown; pterostigma dark brown.

Described from four specimens taken by Mr. John Hewitt at Kuching in 1908. *Type.*— M. C. Z. 8,946.

I have described this male in detail and given it a name, although in closely resembles the male of *M. greeni* Forel from Ceylon, described from a mature pupa, because no adult winged male of the genus has been described. The Bornean specimens may belong to a different species, possibly *M. sauteri* Forel of Formosa or *M. bakeri* Wheeler of the Philippines, both known only from females. It can hardly be the male of the only other known species of *Metapone*, *M. mjöbergi* Forel of Queensland. The four specimens of *M. hewitti* have been in my collection for many years and were placed provisionally with Cataulacus. Forel's very careful description and figures (Rev. Suisse zool., 1911, **19**, pl. 14) finally enabled me to recognize them as Metapone males. Forel is, I believe, in error in stating that the antennae of the male *M. greeni* are 11-jointed. He has apparently overlooked the second funicular joint. As Green has shown, the species of this extraordinary genus nest in decayed branches. He found the types of *M. greeni* and their larvae in company with termites.

48. Tetraponera nigra (Jerdon).

Ecilon nigrum Jerdon, Madras journ. lit. sci., 1851, **17**, p. 112, ☿.

Tetraponera atrata Smith, Ann. mag. nat. hist., 1852, ser. 2, **9**, p. 44, ☿; Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 70, ♀.

Pseudomyrma nigra Smith, Cat. Hymenop., Brit. mus., 1858, **6**, p. 159, ☿.

Pseudomyrma atrata Smith, ibid. p. 159.

Pseudomyrma carbonaria Smith, Journ. Proc. Linn. soc. London Zool., 1863, **7**, p. 20, ☿ ♀.

Sima nigra Emery in Dalla Torre, Cat. Hymenop., 1893, **7**, p. 54.

Type-locality: Malabar, Southern India (Jerdon).
Sarawak (A. R. Wallace).

49. TETRAPONERA ATTENUATA Smith.

Tetraponera attenuata Smith, Trans. Ent. soc. London, 1877, p. 71, ☿.
Sima attenuata Ern. André, Mém. Soc. zool. France, 1892, **5**, p. 53, ☿.
Sima (*Tetraponera*) *attenuata* var. *tenuissima* Emery, Ann. Mus. civ. Genova, 1900, ser. 2, **20**, p. 675, ☿ ♀, fig. 5b.

Type-locality: Sarawak.
Kapouas Basin (Chaper); Tandjong, S. E. Borneo (Fritz Suck).
A single worker from Kuching (John Hewitt).

*50. TETRAPONERA DIFFICILIS Emery.

Sima (*Tetraponera*) *difficilis* Emery, Ann. Mus. civ. Genova, 1900, ser. 2, **20**, p. 676, ☿.

Type-locality: Benculen, Sumatra (E. Modigliani).
Six workers from Kuching (John Hewitt).

51. TETRAPONERA PILOSA (Smith).

Pseudoponera pilosa Smith, Cat. Hymenop. Brit. mus., 1858, **6**, p. 160, ☿.
Sima pilosa Emery, Ann. Mus. civ. Genova, 1887, ser. 2, **5**, p. 449 *nota;* Emery, ibid., 1900, ser. 2, **20**, p. 675.

Type-locality: Borneo.
Two workers and a deälated female from Kuching (John Hewitt).

52. MYRMICA RITAE Emery.

Myrmica ritae Emery, Ann. Mus. civ. Genova, 1889, ser. 2, **7**, p. 501, ☿, pl. 11, fig. 27; ibid., 1894, ser. 2, **14**, p. 451, ☿.

Type-locality: Mt. Mooleyit (1,000–1,900 m.), Tenasserim (L. Fea).
Pulo Laut, Borneo (W. Doherty).

*53. PHEIDOLE MEGACEPHALA (Fabricius).

Formica megacephala Fabricius, Ent. syst., 1793, **2**, p. 361, ♃.
Formica (*Myrmica*) *trinodis* Losana, Mem. Accad. sci. Turino, 1834, **37**, p. 327, pl. 36, fig. 6.

Oecophthora pusilla Heer, Hausameise Madeiras, 1852, p. 15, ♃ ☿ ♀ ♂, pl. **1**, fig. 1–4.

Myrmica? laevigata Smith, Trans. Ent. soc. London, 1855, ser. 2, **3**, p. 130, ☿, pl. 9, fig. 7, 8.

Myrmica trinodis Mayr. Verh. Zool. bot. gesellsch. Wien, 1855, **5**, p. 414, *nota*, ☿.

Myrmica (*Pheidole*) *laevigata* Smith, Cat. Brit. fossor. Hymenop., 1858, p. 35, 225, ☿.

Pheidole pusilla Smith, Cat. Hymenop. Brit. mus., 1858, **6**, p. 173, pl. 9, fig. 18–20.

Pheidole janus Smith, ibid., p. 175, ♀, pl. 9, fig. 13–17.

Pheidole megacephala Roger, Verzeich. formicid., 1863, p. 30; Dalla Torre, Cat. Hymenop., 1893, **7**, p. 92.

Type-locality: Mauritius (Coll. Bosc).

Numerous soldiers and workers from Kuching (John Hewitt and H. W. Smith).

54. Pheidole javana Mayr.

Pheidole javana Mayr, Tijdschr. ent., 1867, **10**, p. 98, ♃ ☿.

Type-locality: Java.

Sarawak (Doria and Beccari; Bedot and Pictet); Kapouas Basin (Chaper).

Two soldiers and several workers from Kuching (John Hewitt) and Sarawak (H. W. Smith).

*55. Pheidole bugi, sp. nov.

Soldier. Length 2 mm.

Head large, subrectangular, longer than broad, with nearly straight subparallel sides, slightly narrowed at the posterior corners, with deeply and angularly excised occipital border, distinctly depressed in the occipital region and with distinct occipital groove. Eyes small, with angular inferior orbits, situated at the anterior fourth of the head. Mandibles large, convex, with broad apical margins, furnished at their tips with a pair of large, blunt teeth. Clypeus flattened, or slightly concave in the middle, ecarinate, its anterior border deeply notched. Frontal area distinct, semicircular, impressed. Frontal carinae rather short, diverging behind and bordering flattened, indistinct scrobe-like areas. Antennae short and slender, the scapes reaching the lateral borders of the head a little behind the eyes and in front of the middle;

joints 2–7 of the funiculi distinctly broader than long; club somewhat longer than the remainder of the funiculus. Thorax robust, the pronotum broad and convex, its humeri protruding as bluntly rounded angles; mesonotum sloping, with a transverse torus in the middle. Epinotum low, its base in profile straight and longer than the declivity; the spines short, rather erect, much shorter than the base of the epinotum and shorter than their distance apart at their insertions. Petiole short, the anterior slope of the node very concave, its summit blunt, transverse, and rather deeply emarginate, its posterior slope abrupt. Postpetiole slightly broader than the petiole, transverse, very convex above, broader in front than behind, the sides rounded. Gaster broadly elliptical, flattened, smaller than the head, with straight anterior border. Legs with stout, slightly swollen femora.

Somewhat shining; mandibles smooth, minutely and sparsely punctate. Clypeus smooth and shining in the middle, rugose on the sides; remainder of head sculptured, the anterior ⅔ longitudinally rugose, with feebly reticulate interrugal areas, especially on the sides, the posterior third reticulately rugose, the scrobe-like areas densely punctate. Neck, pronotum, and mesonotum more finely reticulate-rugose; epinotum smooth and shining; petiole and postpetiole subopaque, indistinctly and very finely punctate or alutaceous. Gaster and legs smooth and shining, sparsely and finely punctate.

Hairs yellow, erect or suberect, coarse, rather long, of uneven length, more abundant on the body than on the appendages.

Ferruginous; gaster darker, brown; legs and antennae paler, more yellowish; borders of mandibles and clypeus blackish.

Worker. Length 1.4 mm.

Head ⅕ longer than broad, subrectangular, with very feebly convex sides and feebly sinuate posterior border, as broad in front as behind. Eyes very small, at the middle of the sides of the head. Mandibles with oblique apical margins furnished with four acute, subequal teeth. Clypeus short, convex, its anterior border broadly rounded, entire. Antennal scapes reaching the posterior border of the head. Thorax rather slender; pro- and mesonotum fused, feebly rounded above and on the sides; mesoëpinotal constriction short and deep. Epinotum with subequal base and declivity, the spines reduced to small, rather blunt teeth, not longer than broad at their bases. Superior border of petiolar node transverse and entire. Postpetiole much as in the soldier.

Smooth and shining; mesopleurae and sides of epinotum densely punctate; petiolar and postpetiolar nodes subopaque.

Hairs whitish, erect, more uniform and somewhat more abundant than in the soldier, especially on the legs and scapes.

Yellowish brown; head and gaster a little darker; thorax and appendages paler and more yellowish.

Described from a single soldier and four workers from Sarawak, (Roland Thaxter). *Type.*— M. C. Z. 8,947.

This species is evidently related to *Ph. nodgii* Forel of Java, but the soldier is smaller, with more deeply notched clypeus, much less distinct antennal scrobes, shorter epinotal spines, more deeply notched petiolar node, laterally less angular postpetiole, and very different thoracic sculpture. The worker *bugi* is also smaller than that of *nodgii*, has a more elongate head, very feebly armed epinotum, a more rounded postpetiole, and very different sculpture.

56. Pheidole aristotelis Forel.

Pheidole aristotelis Forel, Rev. Suisse zool., 1911, **19**, p. 43, ♃ ☿ ♂.

Type-locality: Sarawak, Borneo (Haviland).

57. Pheidole comata Smith.

Pheidole comata Smith, Cat. Hymenop. Brit. mus., 1858, **6**, p. 176, ☿ ; Mayr, Verh. Zool. bot. gesellsch. Wien, 1886, **36**, p. 360.

Type-locality: Sarawak, Borneo.

58. Pheidole havilandi Forel.

Pheidole havilandi Forel, Rev. Suisse zool., 1911, **19**, p. 38, ♃ ☿ ♀ ♂.

Type-locality: Sarawak, Borneo (Haviland).

59a. Pheidole sauberi Forel subsp. sarawakana Forel.

Pheidole sauberi subsp. *sarawakana* Forel, Rev. Suisse zool., 1911, **19**, p. 45, ♃ ☿ .

Type-locality: Sarawak, Borneo (Haviland).

60. Ischnomyrmex longipes (Smith).

Myrmica longipes Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 70, ☿ , pl. 1, fig. 6.

Myrmica (Monomorium) longipes Smith, Cat. Hymenop. Brit. mus., 1858, **6**, p. 126, ☿ .

Ischnomyrmex longipes Mayr, Tijdschr. ent., 1867, **10**, p. 60, ☿ ; Ern. André, Mém. Soc. zool. France, 1892, **5**, p. 53, ☿ .

Aphaenogaster longipes Emery, Ann. Mus. civ. Genova, 1888, ser. 2, **5**, p. 531, ☿ , pl. 9, fig. 2.

Aphaenogaster (*Ischnomyrmex*) *longipes* Forel, Rev. Suisse zool., 1911, **19**, p. 24, ☿ .

Pheidole (*Isopheidole*) *longipes* Forel, Rev. Suisse zool., 1912, **20**, p. 765, ♃ ☿ .

Pheidole (*Ischnomyrmex*) *longipes* Forel, Zool. jahrb. Syst., 1913, **36**, p. 49, ♃ ♀, fig. N.

Type-locality: Sarawak, Borneo (A. R. Wallace).

Sarawak (Haviland); Kapouas Basin (Chaper).

Nine workers from the Rambungan River, Sarawak (H. W. Smith) and one from Kuching (John Hewitt).

61. Myrmicaria carinata (Smith).

Heptacondylus carinatus Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 73, ☿ .

?*Physatta dromedarius* Smith, ibid., p. 78, ♀ .

Myrmicaria carinata Dalla Torre, Cat. Hymenop., 1893, **7**, p. 155.

Myrmicaria fodiens race *carinata* Emery, Rev. Suisse zool., 1893, **1**, p. 219.

Type-locality: Sarawak, Borneo (A. R. Wallace).

Tandjong, S. E. Borneo (Fritz Suck).

Two workers and two males from Kina Balu, N. Borneo, obtained from Staudinger. The worker has the gaster distinctly striated at the base. This character, not mentioned by Smith, nevertheless exists in the type (*teste* W. F. Kirby) and is regarded by Emery as distinctive of the species.

*61a. Myrmicaria carinata subsp. gagatina, subsp. nov.

Worker. Length 5.7 mm.

The series of small angles formed by the lateral carinae of the meso- and epinotum are somewhat more acute than in the typical form and the body is much smoother and more shining. There are only a few delicate longitudinal rugae on the head, some confined to the sides and just below and above the eyes and some abbreviated and widely separated on the posterior portion of the head. On the thorax the rugae are also finer, more regular and further apart. The extreme base of the gaster is finely striated as in typical *carinata*.

The color, however, is very different, the body being jet black, with the mandibles, antennae, legs, neck, and articulations of the pedicel dark reddish brown. The hairs covering the body and appendages are very dark brown, almost black.

Described from a single worker taken by Mr. G. E. Bryant on Matang Mt., West Sarawak and sent me by Mr. Horace Donisthorpe.

62. MYRMICARIA SUBCARINATA (Smith).

Heptocondylus subcarinatus Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 73, ☿.
Physatta gibbosa Smith, Cat. Hymenop. Brit. mus., 1858, **6**, p. 172, ♀.
Heptacondylus dromedarius Mayr, Verh. Zool. bot. gesellsch. Wien., 1862, **12**, p. 757, ☿ (*nec* Smith).
Myrmicaria subcarinata Mayr, Tijdschr. ent., 1867, **10**, p. 112, ☿ ♀.
Myrmicaria fodiens race *subcarinata* Emery, Rev. Suisse zool., 1893, **1**, p. 219.

Type-locality: Sarawak, Borneo (A. R. Wallace).

Sarawak (Doria and Beccari; Haviland); Kapouas Basin (Chaper); Tandjong (Fritz Suck).

Two workers from British North Borneo (E. B. Kershaw).

63. MYRMICARIA RUGOSA (Smith).

Heptacondylus rugosus Smith, Journ. Proc. Linn. soc. London. Zool. Suppl., 1860, 4, 110, ☿.
Myrmicaria (Heptacondylus) rugosus Smith, ibid., 1864, **8**, p. 73, ☿ ♀ ♂.
Myrmicaria rugosa Mayr, Tijdschr. ent. 1867, **10**, p. 113, ☿.

Type-locality: Batjan (A. R. Wallace).

Tandjong, S. E. Borneo (Fritz Suck).

64. MYRMICARIA ARACHNOIDES (Smith).

Heptacondylus arachnoides Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 72, ☿ ♀.
Heptacondylus longipes Smith, Cat. Hymenop. Brit. mus., 1858, **6**, p. 142, ☿.
Myrmicaria longipes Mayr, Tijdschr. ent., 1867, **10**, p. 113, ☿ ♀ ♂.
Myrmicaria arachnoides Emery, in Dalla Torre, Cat. Hymenop., 1893, **7**, p. 155.

Type-locality: Sarawak, Borneo (A. R. Wallace).

Tandjong, S. E. Borneo (Fritz Suck); Kapouas Basin (Chaper); Sarawak (Doria and Beccari).

A male, female, and worker from Kuching (John Hewitt) and a male and a dozen workers from the same locality (H. W. Smith). Hewitt's specimens are accompanied by two of the peculiar nests of this ant, which consist of coarse, fibrous carton, built in the form of a series of contiguous and rather irregular chambers on the under surfaces of large leaves. One of the nests is 9 cm. long, 5 cm. broad and 2–3 cm. high, the other 8 cm. long, 4 cm. broad and 2 cm. high. These nests have been observed by Jacobson and von Buttel Reepen in Java and are briefly described by Forel (Notes of the Leyden mus., 1909, **31**, p. 252 and Zool. jahrb. Syst., 1913, **36**, p. 73).

*64a. MYRMICARIA ARACHNOIDES subsp. MELANOGASTER Emery.

Emery, Ann. Mus. civ. Genova, 1900, ser. 2, **20**, p. 692 *nota*, ☿.
Forel, Rev. Suisse zool., 1911, **19**, p. 23, ☿ ♀ ♂.

Type-locality: Sarawak, Borneo.
Sarawak (Haviland); Hayvep (Zimmer).

*65. CARDIOCONDYLA NUDA (Mayr).

Leptothorax nudus Mayr, Sitzb. Akad. wiss. Wien, 1866, **53**, p. 508, ☿.
Cardiocondyla nuda Forel, Mitth. Münch. ent. ver. 1881, **5**, p. 3, ☿.

Type-locality: Ovalau, Fiji (Mus. Godeffroy).
A single worker from Sarawak (H. W. Smith).

66. CREMATOGASTER BRUNNEA Smith.

Crematogaster brunneus Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 75, ☿
Cremastogaster brunnea Mayr, Verh. Zool. bot. gesellsch. Wien, 1886, **36**, p. 360, ☿.
Cremastogaster brunca Dalla Torre, Cat. Hymenop., 1893, **7**, p. 80.

Type-locality: Sarawak, Borneo (A. R. Wallace).

A single worker from Sarawak (H. W. Smith) agrees well with Smith's description of the worker minor of this species although the color is somewhat darker. Unfortunately the thorax is somewhat crushed so that its precise form cannot be determined.

67. CREMATOGASTER CEPHALOTES Smith.

Crematogaster cephalotes Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 75, ☿ (*nec* Gerstaecker).

Cremastogaster cephalotes Ern. André, Mém. Soc. zool. France, 1892, **5**, p. 53, ☿.

Type-locality: Sarawak, Borneo (A. R. Wallace).

Kapouas Basin (Chaper).

68. CREMATOGASTER CORIARIA Mayr.

Cremastogaster coriaria Mayr, Ann. Mus. civ. Genova, 1872, **2**, p. 154, ☿; Emery, ibid., 1887, ser. 2, **5**, p. 467, ☿.

Type-locality: Sarawak, Borneo (Doria and Beccari).

69a. CREMATOGASTER EGIDYI Forel subsp. SPINOZAE Forel.

Cremastogaster egidyi subsp. *spinozai* Forel, Rev. Suisse zool., 1911, **19**, p. 25, ☿ ♀.

Type-locality: Sarawak, Borneo (Haviland).

69b. CREMATOGASTER EGIDYI subsp. SPINOZAE var. HAYVEPANA Forel.

Cremastogaster egidyi subsp. *spinozai* var. *hayvepana* Forel, Rev. Suisse zool., 1911, **19**, p. 26, ☿ ♀.

Type-locality: Hayvep, Borneo (Winkler).

70. CREMATOGASTER FERRARII Emery.

Cremastogaster ferrarii Emery, Ann. Mus. civ. Genova, 1888, ser. 2, **5**, p. 533, ☿; Emery, Rev. Suisse zool., 1893, **1**, p. 193.

Type-locality: Siboga, Sumatra (E. Modigliani).

Sarawak, Borneo (Bedot and Pictet).

71. CREMATOGASTER FRAXATRIX Forel.

Cremastogaster fraxatrix Forel, Rev. Suisse zool., 1911, **19**, p. 28, ☿.

Type-locality: Sarawak, Borneo (Haviland).

72. CREMATOGASTER INNOCENS Forel.

Cremastogaster innocens Forel, Rev. Suisse zool., 1911, **19**, p. 30, ☿ ♀.

Type-locality: Hayvep, Borneo (Winkler).

73. CREMATOGASTER LONGIPILOSA Forel.

Cremastogaster longipilosa Forel, Ann. Mus. nat. Hungar., 1907, **5**, p. 24, ☿; Forel, Rev. Suisse zool., 1911, **19**, p. 24, ☿.

Type-locality: Kwala Lampur, Malacca (Biro).
Sarawak, Borneo (Haviland).
Eleven workers from Sarawak (H. W. Smith; Roland Thaxter).

74. CREMATOGASTER MODIGLIANII Emery.

Crematogaster modiglianii Emery, Ann. Mus. civ. Genova, 1900, ser. 2, **20**, p. 688, ☿.

Type-locality: Sipora, Mentawei (E. Modigliani).
Banguey, Borneo (Coll. Emery).

74a. CREMATOGASTER MODIGLIANII var. SARAWAKANA Forel.

Cremastogaster modiglianii v. *sarawakana* Forel, Rev. Suisse zool., 1911, **19**, p. 25, ☿.

Type-locality: Sarawak, Borneo (Haviland).
Ten workers from the Rambungan River, Sarawak (H. W. Smith).

75. CREMATOGASTER MYOPS Forel.

Cremastogaster myops Forel, Rev. Suisse zool., 1911, **19**, p. 31, ☿ ♀.

Type-locality: Sarawak, Borneo (Haviland).

76. CREMATOGASTER OBSCURA Smith.

Crematogaster obscura Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 76, ☿; Smith, Cat. Hymenop. Brit. mus., 1858, **6**, p. 137, ☿.

Type-locality: Sarawak, Borneo (A. R. Wallace).

77a. CREMATOGASTER ROGENHOFERI Mayr var. FICTRIX Forel.

Cremastogaster rogenhoferi var. *fictrix* Forel, Rev. Suisse zool., 1911, **19**, p. 27, ☿.

Type-locality: Sarawak, Borneo (Haviland).

78. CREMATOGASTER SUBCIRCULARIS Mayr.

Cremastogaster anthracina Mayr, Tijdschr. ent., 1867, **10**, p. 75, ☿; Mayr, Ann. Mus. civ. Genova, 1872, **2**, p. 154 (*nec* Smith).
Cremastogaster subcircularis Mayr, Verh. Zool. bot. gesellsch. Wien, 1878, **28**, p. 681, 685, ☿; Emery, Ann. Mus. civ. Genova, 1887, ser. 2, **5**, p. 467, ☿.

Type-locality: Borneo (Doria and Beccari).

79. CREMATOGASTER SUBNUDA Mayr.

Cremastogaster subnuda Mayr, Verh. Zool. bot. gesellsch. Wien, 1878, **28**, p. 680, 682, ☿; Ern. André, Mém. Soc. zool. France, 1892, **5**, p. 53, ☿.

Type-locality: Calcutta, India.
Kapouas Basin, Borneo (Chaper).

80. CREMATOGASTER (PHYSOCREMA) DIFORMIS Smith.

Crematogaster difformis Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 76, ☿.
Crematogaster ampullaris Smith, ibid., 1861, **6**, p. 47, ☿.
Cremastogaster difformis Mayr, Tijdschr. ent., 1867, **10**, p. 75, ☿.
Cremastogaster edentata Mayr, ibid., p. 104, ♀, pl. 2, fig. 10.
Cremastogaster deformis Emery, Ann. Mus. civ. Genova, 1887, ser. 2, **5**, p. 467, ☿.
Crematogaster deformis Emery, Rev. Suissė zool., 1893, **1**, p. 193.

Type-locality: Singapore (A. R. Wallace).
Sarawak (Doria and Beccari; Bedot and Pictet); Kapouas Basin (Chaper).
A single worker from Kuching (John Hewitt).

*80a. Crematogaster (Physocrema) diformis subsp. physothorax Emery.

Cremastogaster difformis st. *physothorax* Emery, Ann. Mus. civ. Genova, 1889, ser. 2, **7**, p. 506, ☿.
Cremastogaster physothorax Dalla Torre, Cat. Hymenop., 1893, **7**, p. 84.

Type-locality: Thagatá, Tenasserim (L. Fea).
Four workers from Kuching (John Hewitt).

80b. Crematogaster (Physocrema) diformis subsp. sewardi Forel.

Cremastogaster deformis subsp. *sewardi* Forel, Mitth. Naturh. mus. Hamburg, 1901, **18**, p. 64, ☿ ♀.

Type-locality: Borneo (Seward).

81. Crematogaster (Physocrema) inflata Smith.

Crematogaster inflatus Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 76, ☿, pl. 2, fig. 2.
Cremastogaster inflata Mayr, Tijdschr. ent., 1867, **10**, p. 74, ☿; Mayr, Ann. Mus. civ. Genova, 1872, **2**, p. 153; Emery, ibid., 1887, ser. 2, **5**, p. 466, ☿.

Type-locality: Singapore (A. R. Wallace).
Sarawak (Doria and Beccari).
Several workers from Kuching (John Hewitt; H. W. Smith) and one from the Rambungan River, Sarawak (H. W. Smith).

*82. Crematogaster (Physocrema) stethogompha, sp. nov.

Worker. Length 3–6 mm.

Head slightly broader than long, slightly broader behind than in front, with rounded, convex sides and broadly concave posterior border. Mandibles stout, rather convex, with oblique, coarsely 5-toothed apical borders. Clypeus moderately convex, ecarinate, with strongly depressed, straight, anterior border. Eyes small, flattened, just behind the middle of the head. Frontal carinae short, subparallel; frontal area small, triangular; frontal groove short and indistinct. Antennae 11-jointed; scapes reaching the posterior corners of the head; funiculi with 4-jointed club, all the joints longer than broad. Thorax resembling that of *C. deformis*, but the epinotum is less swollen above and is armed with two sharp, backwardly directed spines, which are longer than broad at their distinctly swollen bases. Promesonotal suture absent, pro- and mesonotum together, excluding the neck, as long as broad, robust, only slightly narrowed behind to the mesoëpinotal suture, which is distinct and transverse, but not impressed. The epinotum is broader than long, broader than the pro- and mesonotum, bulging on the sides and dorsally in front so that the base is very convex in profile. The declivity falls off vertically between the spines; it is as long as the base and longitudinally grooved in the middle. A more or less distinct carina or prominent ruga runs along the middorsal line of the thorax from the neck to the epinotal declivity, with an interruption at the mesoëpinotal suture. Petiole longer than broad, as broad in front as behind, octagonal, the anterior and posterior borders longer than the six other sides, which are subequal. In some specimens, especially in the small workers, the angles become rounded so that the petiole may be described as elongate elliptical. Its upper surface is flat; in profile it is slightly thicker at the posterior than at the anterior end. Postpetiole as broad as the petiole, contracted posteriorly, its anterodorsal surface flat, bilobed behind, but without a median longitudinal furrow in large specimens, feebly sulcate in small specimens. Gaster thick and broad, triangular, with straight anterior border, rounded anterior corners and pointed tip. Legs moderately long and stout.

Opaque; gaster and mandibles distinctly shining; the latter coarsely longitudinally striate and punctate. Clypeus and head densely punctate and reticulate-rugose, with more prominent longitudinal rugae anteriorly, growing finer and merging with the punctate surface on the occiput, sides, and posterior corners. Thorax densely punctate, the upper surface of the pro- and mesonotum and base of the epinotum also vermiculately rugose. Petiole, postpetiole, and first gastric segment much more finely and densely punctate than the thorax, the first segment also with sparser and somewhat larger, piligerous punctures; remaining gastric segments, legs, and scapes smoother, more shining, transversely alutaceous; the legs with sparse, coarse piligerous punctures.

Hairs short, whitish, delicate, sparse, and erect, of uneven length on the body, more numerous on the head and thorax than on the pedicel and gaster; shorter and more appressed on the legs and antennae. Pubescence pale, rather long, sparse, very distinct on the gaster and sides and posterior corners of the head.

Dark brown; mandibles, except the teeth, gula, and sometimes the lateral and posterior corners of the head, sides of epinotum, upper surface of petiole and articulations of legs, ferruginous red, second to fourth tarsal joints reddish yellow.

Numerous workers taken by Harrison W. Smith near Kuching (type-locality) and three workers from the Rambungan River, Sarawak. *Type.*— M. C. Z. 8,948.

This species is quite distinct from the other East Indian Physocremas, especially *deformis*, *inflata*, and *tumidula* Emery, and easily recognized by its large size, coarse sculpture, and well-developed epinotal spines. It is much more closely related to a form described by Forel from Malacca as *C. deformis* subsp. *vacca* (Bull. Soc. Vaud. sci. nat., 1911, ser. 5, **47**, p. 384) but which, I believe, should be regarded as an independent species. This Malaccan form, however, is black, measures only 3.3–3.5 mm., and has the epinotum much less swollen, and apparently even less distinctly constricted off from the mesonotum than in *stethogompha*, and the postpetiole is sulcate dorsally. It is, perhaps, admissible to regard *stethogompha* as a subspecies of *vacca*.

*82a. CREMATOGASTER (PHYSOCREMA) STETHOGOMPHA var. DETRITINODIS, var. nov.

Worker. Length 3.5 mm.

Differing from the typical form in having the head less distinctly concave behind and in sculpture, the rugae of the head and thorax being finer, so that the dense puncturation is more apparent and the vermiculate rugosity of the thorax is laxer and finer, especially in the middorsal region. The petiole and postpetiole are shining, the former elongate elliptical, the latter with a distinct median furrow. Mandibles more yellowish than in the typical form.

A single worker from the Sarawak River, Kuching (H. W. Smith).

83. CREMATOGASTER (OXYGYNE) DAISYI Forel.

Cremastogaster (Oxygyne) daisyi Forel, Ann. Soc. ent. Belgique, 1901, **45**, p. 376, ☿ ♀.

Type-locality: Sarawak (Haviland).

84. CREMATOGASTER (DECACREMA) DECAMERA Forel.

Cremastogaster (Decacrema) decamera Forel, Ann. Soc. ent. Belgique, 1910, **54**, p. 18 *nota*, ☿ ♀ ♂.

Type-locality: Sarawak (Haviland).

Five workers and a deälated female from Kuching (John Hewitt), "from Macaranga with slightly trifid leaves," and a winged female from British North Borneo (E. B. Kershaw).

85. CREMATOGASTER (DECACREMA) BORNEËNSIS Ern. André.

Cremastogaster borneënsis Ern. André, Rev. ent., 1896, p. 263, ☿.

Type-locality: Borneo.

85a. CREMATOGASTER (DECACREMA) BORNEËNSIS var. INSULSA Forel.

Cremastogaster (Decacrema) borneënsis var. *insulsa* Forel, Rev. Suisse zool., 1911, **19**, p. 33, ☿ ♀ ♂.

Type-locality: Borneo (Hose).

85b. CREMATOGASTER (DECACREMA) BORNEËNSIS var. HARPYIA Forel.

Cremastogaster (Decacrema) borneënsis var. *harpyia* Forel, Rev. Suisse zool., 1911, **19**, p. 33, ☿ ♀.

Type-locality: Sarawak, Borneo (Haviland).

85c. CREMATOGASTER (DECACREMA) BORNEËNSIS subsp. SYMBIA Forel.

Cremastogaster (Decacrema) borneënsis subsp. *symbia* Forel, Rev. Suisse zool., 1911, **19**, p. 34, ☿ ♀ ♂.

Type-locality: Sarawak, Borneo (Haviland).

85d. CREMATOGASTER (DECACREMA) BORNEËNSIS subsp. NOVEM Forel.

Cremastogaster (Decacrema) borneënsis subsp. *novem* Forel, Rev. Suisse zool., 1911, **19**, p. 35, ☿ ♀.

Type-locality: Sarawak, Borneo (Haviland).

I refer a single female from British North Borneo (E. B. Kershaw), to this subspecies.

85e. CREMATOGASTER (DECACREMA) BORNEËNSIS subsp. HOSEI Forel.

Cremastogaster (Decacrema) borneënsis subsp. *hosei* Forel, Rev. Suisse zool., 1911, **19**, p. 35, ☿.

Type-locality: Sarawak, Borneo (Haviland).

85f. CREMATOGASTER (DECACREMA) BORNEËNSIS subsp. CAPAX Forel.

Cremastogaster (*Decacrema*) *borneënsis* subsp. *capax* Forel, Rev. Suisse zool., 1911, **19**, p. 37, ☿ ♀.

Type-locality: Sarawak, Borneo (Haviland).

86. CREMATOGASTER (DECACREMA) CAPTIOSA Forel.

Cremastogaster (*Decacrema*) *captiosa* Forel, Rev. Suisse zool., 1911, **19**, p. 37, ☿.

Type-locality: Sarawak, Borneo (Haviland).

87. CREMATOGASTER (DECACREMA) ANGULOSA Ern. André.

Cremastogaster angulosa Ern. André, Rev. ent., 1896, p. 264, ☿.

Type-locality: Borneo.

88. CREMATOGASTER (DECACREMA) BIFORMIS Ern. André.

Cremastogaster biformis Ern. André, Mém. Soc. zool. France, 1892, **5**, p. 53, ☿.

Type-locality: Kapouas Basin, Borneo (Chaper).

89. VOLLENHOVIA PUNCTATOSTRIATA Mayr.

Vollenhovia punctatostriata Mayr, Reise Novara. Zool., **2**. Formicid., 1865, p. 21, *nota*, ♀; Mayr, Tijdschr. ent., 1867, **10**, p. 94, ♀; Mayr, Ann. Mus. civ. Genova, 1872, **2**, p. 152, ♀; Emery, ibid., 1887, ser. 2, **5**, p. 453, ♀.

Type-locality: Java (Leyden Museum).
Sarawak (Doria and Beccari).

90. VOLLENHOVIA RUFIVENTRIS Forel.

Vollenhovia rufiventris Forel, Ann. Soc. ent. Belgique, 1901, **45**, p. 374, ☿.
Monomorium rufiventre Emery, in Sarasin and Roux, Nova Caledonia. Zool., 1914, **1**, p. 407 *nota*, ☿.

Type-locality: Sarawak, Borneo (Haviland).
Female. Length 11.5 mm.

Head rectangular, slightly longer than broad, nearly as broad in front as behind with feebly excised posterior border and a large shallow impression on each side of the vertex. Eyes small, near the middle of the sides, ocelli very small, the anterior distinctly larger than the posterior. Mandibles large, with nearly straight external borders, the apical borders broad, deeply and arcuately excised in the middle, with three large, subequal teeth at the apical and three smaller, blunt teeth at the basal end of the excision. Clypeus very short on the sides, rather flat in the middle, with a narrow elongation backward between the frontal carinae, the anterior border straight and entire. Frontal area obsolete; frontal carinae well-developed, nearly half as long as the antennal scapes, slightly diverging behind, nearly as far apart as their distance from the lateral border of the head. Antennae short, 12-jointed, the scapes strongly curved at the base, their tips reaching only to the posterior orbits; the funiculi with a 3-jointed club; joints 2–5 broader than long, joint 6 as long as broad, the remaining joints longer than broad. Thorax rather small, as broad as the head, the pronotum with submarginate sides and bluntly rectangular humeri, the mesonotum flattened above, as long as broad, prolonged in the middle anteriorly; the epinotum short, in profile evenly rounded and moderately convex, without distinct base and declivity, concave in the middle behind between a pair of slight swellings representing the denticles of other species. Petiole from above regularly rectangular, 1½ times as long as broad, as broad in front as behind, with sharp anterior and posterior angles; in profile, with a node as high as the segment, its anterior surface concave, its posterior convex, the summit blunt and rounded; the lower surface anteriorly produced as a large protuberance translucent in the middle, and tipped with a small, blunt tooth. Postpetiole subrectangular, with convex sides and dorsum, slightly broader than long and broader than the petiole, its ventral surface with a large, thick, pointed, downwardly directed tooth at the anterior end. Gaster elongate elliptical, narrowed anteriorly and posteriorly. Legs with much thickened femora and clavate tibiae. Wings nearly 8 mm. long, narrow, with a single cubital and a small, narrow discoidal cell; radial cell open; pterostigma small but distinct.

Very shining; mandibles sparsely punctate, sharply longitudinally striate along the external borders and at the tip. Clypeus uneven but not rugose. Cheeks and anterior ¾ of head above, longitudinally and rather densely rugose, with interspersed punctures; occipital region and sides of gula with coarse, piligerous punctures. Pronotum coarsely and sparsely punctate, indistinctly striate on the sides. Mesonotum finely, longitudinally rugose behind, anteriorly smooth in the middle and coarsely and sparsely punctate on the sides. Scutellum and sides of epinotum sharply, longitudinally rugose, the former smooth and more or less coarsely punctate in the middle. Slope of epinotum, petiole, postpetiole, gaster, scapes, and legs very smooth and shining, with sparse piligerous punctures; lateral and ventral portions of petiole and postpetiole densely and finely punctate.

Hairs slender, pointed, whitish, sparse, of very unequal length, suberect or erect, shorter and more reclinate on the appendages, partly short and appressed on the gaster.

Black; terminal antennal joint, articulations of legs and tarsi, beyond the basal joint, reddish brown; cheeks and tips of mandibles obscurely tinged with red. Wings distinctly infuscated, more deeply along the anterior margin; veins and pterostigma dark brown.

Described from a single specimen taken on Mt. Matang, West Sarawak by G. E. Bryant and sent me by Mr. Horace Donisthorpe. There is also a worker from Kuching (John Hewitt) in my collection.

I have described the female in detail on account of its interest in connection with Emery's contention (in Sarasin and Roux, Nova Caledonia. Zool., 1914, **1**, p. 407 *nota*) that *rufiventris* is really a Monomorium, mainly because the worker is smooth and shining and has a slightly pedunculate petiole. Although my specimen is not accompanied by workers, Forel's recent discovery (Tijdschr. ent., 1915, **58**, p. 23) of all three phases of a new variety of this ant, var. *simalurana* from Simalur, a small island off the west coast of Sumatra, shows that the Bornean female must belong to the typical *rufiventris* or one of its varieties. The worker *simalurana* varies from 3–7.9 mm. in length, the female measures 12–12.5 mm. and the male only 4.4 mm. These extraordinary differences in stature are comparable to those previously noted by Forel (Philippine journ. sci., 1910, **5**, p. 125) in *V. oblonga* subsp. *dispar*, the worker of which measures 3.2 mm., the female 8 mm., the male 3.8 mm. Certainly the female of what I take to be the typical *rufiventris* described above and that of the var. *simalurana*, which is merely somewhat larger and very slightly different in other respects, must be regarded as belonging to Vollenhovia. It is, moreover, closely related to *V. striatopunctata* Mayr, known only from the female (9–10 mm. long), and considered by Emery as probably the female of *V. oblonga* subsp. *laevithorax* Emery (*loc. cit.*, p. 406). In some species and subspecies of Vollenhovia, however, the female is only slightly larger than the worker, *e.g.*, in *V. emeryi* Wheeler of Japan and in a Bornean subspecies of *V. banksi* Forel described below.

91a. VOLLENHOVIA OBLONGA Smith var. RUFESCENS Emery.

Vollenhovia rufescens Emery, Bull. Soc. ent. France, 1894, p. 69, ☿.

Vollenhovia oblonga var. *rufescens* Emery, in Sarasin and Roux, Nova Caledonia. Zool., 1914, **1**, p. 406, ☿.

Type-locality: Pulo Laut, Borneo.

Borneo (Coll. Emery).

91b. VOLLENHOVIA OBLONGA subsp. ALLUAUDI Emery.

Vollenhovia alluaudi Emery, Bull. Soc. ent. France, 1894, p. 68, ☿.
Vollenhovia oblonga var. *alluaudi* Emery, Ann. Mus. civ. Genova, 1897, ser. 2, **18**, p. 560, ☿.
Vollenhovia oblonga subsp. *alluaudi* Emery, in Sarasin and Roux, Nova Caledonia. Zool., 1914, **1**, p. 406; Forel, Trans. Linn. soc. London. Zool., 1912, ser. 2, **15**, p. 162, ☿ ♀.

Type-locality: Seychelles.
Borneo (Coll. Emery).

91c. VOLLENHOVIA OBLONGA subsp. LAEVITHORAX Emery.

Vollenhovia laevithorax Emery, Ann. Mus. civ. Genova, 1889, ser. 2, **7**, p. 501, ☿.
Vollenhovia oblonga subsp. *laevithorax* Emery, in Sarasin and Roux, Nova Caledonia. Zool., 1914, **1**, p. 406.

Type-locality: Tenasserim (L. Fea).
Borneo (Coll. Emery).

*92. VOLLENHOVIA HEWITTI, sp. nov.

Worker. Length 2.4–2.6 mm.

Head rectangular, about $\frac{1}{5}$ longer than broad, with parallel sides and nearly straight posterior border. Eyes flattened, a little in front of the middle of the sides. Mandibles rather broad, their apical and basal borders meeting at a sharp right angle, the former with three large apical and a few minute and indistinct basal teeth. Clypeus rather convex in the middle, strongly bicarinate, its anterior border straight and entire. Frontal area small, semicircular, frontal carinae short. Antennal scapes reaching nearly to the posterior third of the head; funiculi with a 4-jointed club, joints 2–7 decidedly broader than long. Thorax rather long, narrower than the head, the pro- and mesonotum together longer than broad, with prominent humeri, somewhat flattened dorsally and laterally; mesoëpinotal constriction narrow but distinct. Epinotum from above a little longer than broad, distinctly narrower than the mesonotum, laterally compressed above in profile, with the base feebly rounded, and longer than the abrupt, concave declivity, which is slightly angulate but not dentate on each side above. Petiole narrow, twice as long as broad, as broad in front as behind, through the node nearly as high as long, the latter blunt and rounded, with subequal, slightly concave anterior and feebly convex posterior slope, the ventral surface anteriorly with a compressed, translucent tooth. Postpetiole broader than the petiole, longer than broad, scarcely broader behind than in front, elliptical, with convex lateral and dorsal surfaces.

Shining; mandibles with a few minute, scattered punctures; head with the cheeks and anterior ⅘ above subopaque, longitudinally rugulose and sparsely serially punctate; occiput and lower surface coarsely and sparsely punctate and shining. Thorax above smooth, with small, scattered, piligerous punctures; sides of thorax subopaque and densely punctate; extreme base of first gastric segment sharply striate; remainder of body smooth and shining, with indistinct, scattered, piligerous punctures.

Hairs pale, sparse, of unequal length, erect or reclinate; on the appendages shorter and more appressed.

Dark castaneous brown; mandibles, tips of scapes, funiculi, trochanters, knees, tibiae and tarsi red.

Described from four specimens taken at Kuching (John Hewitt).

This species resembles V. *oblonga* subsp. *laevithorax* Emery in sculpture, but is much smaller, with narrower head, broader mandibles and longer petiole and postpetiole, and is quite different from any of the numerous other species of Vollenhovia recently described by Emery, Forel, and Viehmeyer. The genus is difficult, so that the limits of the subspecies and varieties are still to be established on the basis of much more material than has been collected heretofore.

*93a. VOLLENHOVIA BANKSI Forel subsp. KUCHINGENSIS, subsp. nov.

Worker. Length 1.8–2 mm.

Differing from the typical form from the Philippines in its darker color, the body, femora, and tibiae being dark brown. The meso-ëpinotal impression is visible, though very feeble; the epinotum has a minute denticle on each side, the antennal scapes are a little shorter and the eyes a little further forward on the head.

Female (deälated). Length nearly 3 mm.

Resembling the worker, but the rugae on the head are coarser, more undulating, with finely punctate interrugal spaces. The thorax above is coarsely and rather densely punctate, the pronotum somewhat reticulately rugose, the mesonotum smooth in the middle in front, longitudinally rugulose behind, the mesopleurae rather smooth and shining in the middle. The epinotum is coarsely reticulately rugose, the concavity of the declivity transversely rugose; the petiole and postpetiole above coarsely foveolate. The tips of the antennal scapes reach only a little beyond the median transverse diameter of the head.

Described from twelve workers and a single female from Kuching (John Hewitt) taken "from an old fungus." I have compared the workers with a couple of cotypes of *banksi* received from the Manila Bureau of Science. *Type.*—M. C. Z. 8,949.

94. Monomorium floricola (Jerdon).

Atta floricola Jerdon, Madras Journ. lit. sci., 1851, **17**, p. 107; Jerdon, Ann. mag. nat. hist., 1854, ser. 2, **13**, p. 49, ☿.

Monomorium speculare Mayr, Sitzb. Akad. wiss. Wien, 1866, **53**, p. 509, ☿.

Monomorium floricola Emery, in Dalla Torre, Cat. Hymenop., 1893, **7**, p. 66.

Type-locality: Tellicherry, Southern India (Jerdon).

Sarawak (Doria and Beccari).

Several workers from Kuching (John Hewitt).

95. Monomorium latinode Mayr.

Monomorium latinode Mayr, Ann. Mus. civ. Genova, 1872, **2**, p. 152, ☿; Emery, ibid., 1887, ser. 2, **5**, p. 459, ☿.

Type-locality: Sarawak (Doria and Beccari).

96. Monomorium pharaonis (Linné).

For the long synonymy of this cosmopolitan ant see Dalla Torre, Cat. Hymenop., 1893, **7**, p. 68.

Type-locality: Egypt.

Sarawak (Doria and Beccari).

Numerous workers and deälated females from Kuching, Matang, and Poi (John Hewitt).

*97. Solenopsis geminata (Fabricius) subsp. rufa (Jerdon).

Atta rufa Jerdon, Madras Journ. lit. sci., 1851, **17**, p. 106; Jerdon, Ann. mag. nat. hist., 1854, ser. 2, **13**, p. 48, ♃ ☿ ♀.

Solenopsis geminata Mayr, Verh. Zool. bot. gesellsch. Wien, 1870, **20**, p. 996 (part); Mayr, ibid., 1886, **36**, p. 460 (part); Rothney, Trans. Ent. soc. London, 1889, p. 365.

Solenopsis geminata var. *rufa* Forel, Deutsch. ent. zeitschr., 1909, p. 268.

Solenopsis geminata race *rufa* Forel, Biol. Centr. Amer. Hymenop., 1899-1900, **3**, p. 80.

Type-locality: Malabar, Southern India (Jerdon).
Two workers and a male from Kuching (John Hewitt).

98. LOPHOMYRMEX BEDOTI Emery.

Lophomyrmex bedoti Emery, Rev. Suisse zool., 1893, **1**, p. 192, ☿ ♀.

Type-locality: Deli, Sumatra (Bedot and Pictet).
Pulo Laut, Borneo (Coll. Emery).
A single worker from Kuching (John Hewitt).

99. PHEIDOLOGETON AFFINIS (Jerdon).

Occodoma affinis Jerdon, Madras Journ. lit. sci., 1851, **17**, p. 110, ♃ ☿; Jerdon, Ann. mag. nat. hist., 1854, ser. 2, **13**, p. 51, ♃ ☿.
Pheidole affinis Smith, Cat. Hymenop. Brit. mus., 1858, **6**, p. 174, ☿.
Atta bellicosa Smith, ibid., p. 164, ☿.
Solenopsis laboriosa Smith, Journ. Proc. Linn. soc. London. Zool., 1861, **6**, p. 48, ☿.
Pheidologeton laboriosus Mayr, Verh. Zool. bot. gesellsch. Wien, 1862, **12**, p. 750, ☿.
Pheidologeton affinis Roger, Verzeich. formicid., 1863, p. 30.
Solenopsis calida Smith, Journ. Proc. Linn. soc. London. Zool., 1863, **7**, p. 22, ☿.
Pheidologeton bellicosum Mayr, Verh. Zool. bot. gesellsch. Wien, 1886, **36**, p. 360.

Type-locality: Malabar, Southern India (Jerdon).
Kapouas Basin, Borneo (Chaper).
A single worker media from Sarawak (Roland Thaxter).

100. PHEIDOLOGETON DIVERSUS (Jerdon).

Occodoma diversus Jerdon, Madras Journ. lit. sci., 1851, **17**, p. 109, ☿; Jerdon, Ann. mag. nat. hist., 1854, ser. 2, **13**, p. 51, ☿.
Pheidole diversa Smith, Cat. Hymenop. Brit. mus., 1858, **6**, p. 174, ☿.
Pheidole ocellifera Smith, ibid., p. 174, ♃.
Pheidole pabulator Smith, Journ. Proc. Linn. soc. London. Zool. 1861, **5**, p. 112, ☿.

Pheidologeton ocelliferus Mayr, Verh. Zool. bot. gesellsch. Wien, 1862, **12**, p. 750 ♃, pl. 19, fig. 13.
Pheidologeton megacephalus Roger, Verzeich. formicid., 1863, p. 30 ♃.
Pheidologeton diversus Roger, ibid., p. 30.
Pheidologeton ocellifer Mayr, Reise Novara. Zool., **2**. Formicid., 1865, p. 103.
Pheidologeton pabulator Mayr, Verh. Zool. bot. gesellsch. Wien., 1886, **36**. p. 362.
Pheidole megacephalotes Dalla Torre, Wien. ent. zeit., 1892, **11**, p. 90.

Type-locality: Wynaad, Southern India (Jerdon).
Kapouas Basin, Borneo (Chaper).

101. DILOBOCONDYLA BORNEËNSIS Wheeler.

Dilobocondyla borneënsis Wheeler, Proc. New Engl. zool. club, 1916, **6**, p. 12, ☿, fig. 2.

Type-locality: Bongo Mt., Sarawak, Borneo (John Hewitt).

102. PRISTOMYRMEX TRACHYLISSUS (Smith).

Myrmica (Monomorium) *trachylissa* Smith, Cat. Hymenop. Brit. mus., 1858, **6**, p. 126, ♀.
Pristomyrmex trachylissa Mayr, Verh. Zool. bot. gesellsch. Wien, 1886, **36**, p. 359.
Pristomyrmex trachylissus Dalla Torre, Cat. Hymenop., 1893, **7**, p. 62.

Type-locality: Borneo (A. R. Wallace).

103. MYRMECINA UNDULATA Emery.

Myrmecina undulata Emery, Ann. Mus. civ. Genova, 1900, ser. 2, **20**, p. 678, ☿ ♀.

Type-locality: Si Rambé, Sumatra (E. Modigliani).
Pulo Laut, Borneo (Coll. Emery).

*104. ACANTHOMYRMEX DYAK, sp. nov.

Soldier. Length 5 mm.

Head very large, convex above, overlapping the thorax nearly to the mesoëpinotal constriction, subrectangular, a little longer than broad, with rather straight, subparallel sides, bilobed behind, owing to the deep, angular occipital incision, which is continued into a deep occipital and frontal groove all the way to the frontal area. Eyes small, moderately convex, elongate elliptical at the anterior third of the head. Mandibles very large and convex, with very broad, straight, edentate apical and very concave basal borders. Clypeus depressed on the sides and behind, convex and roof-like, but not carinate in the middle in front, where it projects over the proximal ends of the apical mandibular borders as a short lobe, with straight margin and indistinctly dentate corners. Frontal area rather distinct, triangular. Frontal carinae strongly diverging behind, each bordering a deep narrow scrobe for the antennal scape, running down obliquely to the side of the head a little behind and above the eye. At this point it turns sharply at an angle to form a short scrobe for the base of the funiculus, running forward just above the eye and merging anteriorly into an interrugal space. Antennae slender, the scapes curved and flattened but not dilated at the base. Funiculi with a 3-jointed club, shorter than the remainder of the funiculus; joints 2–8 as long as broad. Thorax short, less than half as broad as the head; pro- and mesonotum rather depressed dorsally where they are covered by the posterior portion of the head; pronotum without spines. Mesoëpinotal constriction not very pronounced. Epinotum very short, its base much shorter than the vertical declivity; the spines very long, slightly curved downward, thick at the base, strongly tapering at the tips, diverging outward, backward and upward, much longer than their distance apart at the base. Metasternal angles small, acute, directed upward. Petiole from above nearly twice as long as broad, a little broader behind than in front, with concave sides and narrow node, armed with two upwardly directed acute spines, the space between which is semicircular; anterior surface of the node long and concave, the posterior straight and abrupt. Postpetiole a little broader than the petiole and a little broader than long, very convex dorsally and rounded on the sides. Gaster only about ¼ as large as the head, subcircular, flattened, with straight anterior border. Femora thickened in the middle, tibiae somewhat clavate.

Rather shining; mandibles smooth, with very fine, widely scattered punctures. Clypeus smooth and shining. Head covered with umbilicate piligerous foveolae, elongate on the gular surface, on the space between the frontal carinae interspersed with strong, diverging longitudinal rugae; cheeks coarsely, longitudinally rugose, space enclosed by the two limbs of the scrobes coarsely reticulate-rugose; the scrobes smooth and shining, not transversely rugose. Thorax coarsely and reticulately rugose; epinotal declivity between the spines and the whole petiole smooth and shining; postpetiole coarsely and indistinctly rugose above, subopaque. Gaster smooth and shining.

Hairs pale grayish, short, erect, blunt, but not thick, sparse, covering the scapes and legs including the funiculi and tarsi as well as the body, more abundant on the gaster; on the antennal scapes, most numerous on the anterior surface; on the legs, most numerous on the extensor surfaces.

Deep ferruginous brown; mandibles, antennae, legs, epinotal spines, and peduncle of petiole deep red; gaster and borders of mandibles blackish.

Worker. Length 3.5 mm.

Head much smaller than in the soldier, as broad as long, rather rectangular, with straight posterior border and feebly convex sides. Eyes small, but very convex, hemispherical, distinctly behind the middle of the head. Mandibles large, shaped somewhat as in the soldier, but with much less convex external borders, with 2 or 3 apical and several minute, widely spaced basal teeth. Clypeus moderately convex, with nearly straight anterior border. Frontal area large, flat, triangular. Antennal scrobes short, limited to a groove for the base of the scapes between the prominent rugae. Antennal scapes straight, not flattened at the base, extending about ⅓ their length beyond the posterior corners of the head. Funiculi also longer than in the soldier, with all the joints longer than broad. Thorax shaped much as in the soldier, but the pronotum with a pair of very long, straight, pointed spines, directed upward and outward, distinctly longer than the similarly directed spines on the epinotum. The latter, however, are bent slightly backwards at a feeble angle just beyond the middle. Shape of petiole, postpetiole, and gaster much as in the soldier, but the spines on the petiole are less spreading and more erect, more slender, and acute.

Sculpture of thorax like that of the soldier; mandibles and clypeus smooth, the anterior border of the latter with short, coarse rugae, the head very coarsely longitudinally rugose, the rugae connected by transverse rugules. Antennal scrobes shining, feebly punctate, transversely rugulose anteriorly. Petiole postpetiole and gaster smooth and shining.

Pilosity and color much like those of the soldier, except that the mandibles are more yellowish and without dark borders.

Described from a single soldier and two workers taken by Mr. John Hewitt at Kuching.

This species seems to be very close to *A. ferox* Emery, based on a worker specimen from Perak. I am, however, unable to make Emery's description of the sculpture of the head and thorax accord with that of the Bornean form. At any rate his words "foveolis piligeris confertis sculptum" do not seem to me to describe the conditions in my specimens. Moreover, he gives the length of his specimen as about 4.5 mm. and describes the two pairs of thoracic spines as equal ("thorax spinis quatuor subrectis, aequalibus armatus"), and the postpetiole as "sublaevis," whereas it is very smooth and shining in *dyak*. The ants of the genus *Acanthomyrmex* seem to be very rare. No one has taken *A. notabilis* since it was described by Smith, and Bingham in the Fauna of British India merely translates Emery's description of *A. luciolae* of Ceylon. Emery has recently based another species, *A. kochi*, from New Guinea (Nova Guinea, **9**, Zool., 1911, **2**, p. 252) on a single worker specimen. It is very small (2.2 mm.), ferruginous yellow, with the spines more curved and more nearly horizontal than in the other species.

*105. ACANTHOMYRMEX DUSUN, sp. nov.

Soldier. Length 3.6 mm.

Head very large, extending back over the thorax to the mesoëpinotal constriction, subrectangular, a little longer than broad, with straight, parallel sides in front and rounded posterior corners, or lobes, separated by an angular occipital incision continuous with a deep occipital and frontal groove, running forward to the clypeus. In profile the dorsal surface of the head is convex and rounded, but distinctly depressed in the middle just in front of the occipital border. Eyes small, elongate elliptical, rather convex, at the anterior fourth of the sides. Clypeus, mandibles, and antennal scrobes shaped much as in *dyak*, but the frontal carinae which border them much more diverging behind and the frontal area obsolete. Antennae also very similar, but joints 2 and 3 more transverse and joints 4–8 as long as broad. Thorax short, the epinotal spines very long, stout at the base, tapering and pointed at the tips, strongly curved backward and downward and somewhat outward. Petiole fully twice as long as broad, its anteroposteriorly compressed node narrowed above, without spines, but with its rather sharp, transverse margin angularly excised. Postpetiole regularly rectangular, broader than long, broader than the petiole, rather flat above. Gaster about ¼ as large as the head, excluding the mandibles, nearly circular, with rather straight anterior border. Femora thickened in the middle, tibiae clavate.

Shining; mandibles and clypeus smooth, the former sparsely and finely punctate, the latter without rugosities along its anterior border. Head covered rather uniformly with sparse, punctate foveolae, the triangular space between the two limbs of each scrobe very coarsely reticulate-rugose, the space between the frontal carinae finely, but not uniformly, longitudinally striate, the scrobes transversely striolate. Thorax and postpetiole very coarsely reticulate-rugose, epinotal declivity between the spines, the petiole and gaster very smooth and shining.

Pilosity much as in *dyak*, but the hairs longer and more delicate, though blunt, and somewhat more numerous on the head, forming an even row along the anterior border of the antennal scapes and more numerous on the extensor than on the flexor surfaces of the legs.

Brownish ferruginous; mandibles, antennae, and legs deep red; petiolar node, postpetiole, and gaster black.

Described from a single specimen taken on Mt. Matang, West Sarawak by Mr. G. E. Bryant and sent me by Mr. Horace Donisthorpe.

This species is certainly very different from *dyak* and *luciolae*, but seems to be closely related to Smith's *notabilis* described from the island of Batjan. Judging from Smith's figure and description, however, *dusun* has a smaller and longer head and more curved epinotal spines. My specimen seems to be too small to be the soldier of Emery's *ferox*.

106. CALYPTOMYRMEX EMERYI Forel.

Calyptomyrmex emeryi Forel, Mitth. Naturh. mus. Hamburg, 1901, **18**, p. 51, ☿ ♂.

Type-locality: Sarawak, Borneo (Haviland).
Female. Length 4.5 mm.

Very similar to the worker. Thorax narrower than the head only slightly longer than broad; mesonotum somewhat flattened above, subtriangular, fully as broad as long; scutellum longitudinally impressed in the middle, overhanging the extremely short, vertical epinotum. Both the mesonotum and scutellum coarsely reticulate-rugose. Wings with well-developed discoidal cell, large pterostigma and single cubital cell, the membranes uniformly brownish hyaline, the veins and pterostigma darker brown.

A single specimen from Kuching (John Hewitt), which has been compared with a worker cotype in my collection.

107. MERANOPLUS CASTANEUS Smith.

Meranoplus castaneus Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 81, ♀, pl. 2, fig. 7; Forel, Zool. jahrb. Suppl., 1912, **15**, p. 61.
Meranoplus cordatus Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 82, ☿, pl. 2, fig. 5; Mayr, Ann. Mus. civ. Genova, 1872, **2**, p. 155, ☿; Emery, ibid., 1887, ser. 2, **5**, p. 470, ☿.

Type-locality: Sarawak, Borneo (A. R. Wallace).
Sarawak (Doria and Beccari).

108. MERANOPLUS MUCRONATUS Smith.

Meranoplus mucronatus Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 82, ☿, pl. 2, fig. 6; Mayr, Tijdschr. ent., 1867, **10**, p. 84, ☿.

Type-locality: Mt. Ophir, Malacca (A. R. Wallace).
Borneo.

*109. TETRAMORIUM CURTULUM Emery.

Tetramorium curtulum Emery, Ann. Mus. civ. Genova, 1894, ser. 2, **14**, p. 22, ☿.

Type-locality: Palon, Burmah (L. Fea).

A single worker from Mt. Matang, West Sarawak (G. E. Bryant), received from Mr. Donisthorpe.

*110. TETRAMORIUM SIMILLIMUM (Smith).

Myrmica simillima (Nylander) Smith, List. Brit. anim. Brit. mus., 1851, **6**, Acul. p. 118, ☿.

Tetrogmus caldarius Roger, Berl. ent. zeitschr., 1857, **1**, p. 12, ☿ ♀.

Myrmica (Leptothorax) simillima Smith, Cat. Brit. foss. Hymenop., 1858, p. 31, ☿.

Myrmica caldaria Meinert, Naturv. afh. Dansk. vid. selsk., 1860, ser. 5, **5**, p. 334, ☿ ♀ ♂.

Tetramorium simillimum Mayr, Europ. Formicid., 1861, p. 61, ♀.

Type-locality: Dorsetshire, England, in a hot-house (Dale).

Four workers from Sarawak (Roland Thaxter).

111. TETRAMORIUM PACIFICUM Mayr.

Tetramorium pacificum Mayr, Verh. Zool. bot. gesellsch. Wien, 1870, **20**, p. 972, 976, ☿ ♀.

Type-locality: Tongatabu, Friendly Islands (Museum Godeffroy).

Kapouas Basin, Borneo (Chaper); Tandjong (Fritz Suck).

112. TETRAMORIUM SCABRUM Mayr.

Tetramorium scabrum Mayr, Verh. Zool. bot. gesellsch. Wien, 1878, **28**, p. 672, ☿.

Type-locality: Borneo (Museum of Pest).

A single worker from Bongo Mt., Sarawak (Hewitt and Brooks).

113. TETRAMORIUM GUINEENSE (Fabricius).

For the synonymy of this common tropicopolitan ant see Dalla Torre, Cat. Hymenop. 1893, **7**, p. 133.

Type-locality: Guinea (Dr. Isert).

Sarawak (Doria and Beccari; Bedot and Pictet); Kapouas Basin (Chaper).

Several workers and a female from Kuching (John Hewitt).

114. TRIGLYPHOTHRIX PARVISPINA Emery.

Triglyphothrix parvispina Emery, Rev. Suisse zool., 1893, **1**, p. 214, ☿.

Type-locality: Pulo Laut, Borneo.

*115. TRIGLYPHOTHRIX STRIATIDENS (Emery).

Tetramorium obesum st. striatidens Emery, Ann. Mus. civ. Genova, 1889, ser. 2, **7**, p. 501, ☿.

Triglyphothrix obesus st. striatidens Emery, Explor. sci. Tunisie. Fourmis, 1891, p. 4.

Triglyphothrix striatidens Dalla Torre, Cat. Hymenop., 1893, **7**, p. 136.

Type-locality: Bhamô, Burmah (L. Fea).

A worker and female from Kuching (John Hewitt) and a worker from Sarawak (Roland Thaxter).

116. CATAULACUS BROOKEI Forel.

Cataulacus brookei Forel, Ann. Soc. ent. Belgique, 1901, **45**, p. 378, ☿ ♀ ♂.

Type-locality: Sarawak, Borneo (Haviland).

117. CATAULACUS GRANULATUS (Latreille).

Formica granulata Latreille, Hist. nat. fourmis, 1802, p. 275, ☿, pl. 12, fig. 75.

Cryptocerus granulatus Lepeletier, Hist. nat. ins. hyménop. 1836, **1**, p. 171.

Cataulacus granulatus Smith, Trans. Ent. soc. London, 1854, ser. 2, **2**, p. 226.

Cataulacus reticulatus Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 81, ☿, pl. 2, fig. 8.

Type-locality: "Grandes-Indes."

Sarawak, Borneo (A. R. Wallace).

117a. CATAULACUS GRANULATUS subsp. HISPIDUS Smith.

Cataulacus hispidus Smith, Trans. Ent. soc. London, 1876, p. 611, ☿, pl. 11, fig. 11.

Cataulacus granulatus subsp. *hispidus* Forel, Rev. Suisse zool., 1911, **19**, p. 24, ☿.

Type-locality: Singapore.

Sarawak, Borneo (Haviland).

A single worker from Kuching (John Hewitt).

118. CATAULACUS HISPIDULUS Smith.

Cataulacus hispidulus Smith, Journ. Proc. Linn. soc. London. Zool., 1864, **8**, p. 76, ☿, pl. 4, fig. 7; Mayr, Ann. Mus. civ. Genova, 1872, **2**, p. 155; Emery, ibid., 1887, ser. 2, **5**, p. 470, ☿; Ern. André, Mém. Soc. zool. France, 1892, **5**, p. 55, ☿.

Cataulacus granulatus var. *hispidulus* Dalla Torre, Cat. Hymenop., 1893, **7**, p. 138.

Type-locality: Sumatra (A. R. Wallace).

Sarawak (Doria and Beccari), Kapouas Basin (Chaper).

Four workers from Kuching (John Hewitt) and one from Bongo Mt. (Hewitt and Brooks).

119. CATAULACUS HORRIDUS Smith.

Cataulacus horridus Smith, Journ. Proc. Linn. Soc. London. Zool., 1857, **2**, p. 81, ☿, pl. 2, fig. 3; Emery, Rev. Suisse zool., 1893, **1**, p. 216.

Cataulacus insularis Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 80, ♂, pl. 2, fig. 4.

Type-locality: Sarawak, Borneo (A. R. Wallace).

Three workers and six males from Kuching (John Hewitt). The males agree very closely with Smith's description of his *C. insularis*, except in having the gaster entirely black, so that I regard *insularis* as a synonym of *horridus*. He describes the gaster of his specimen as reddish at the base, a condition probably due to immaturity.

120. CATAULACUS PRAETEXTUS Smith.

Cataulacus praetextus Smith, Trans. Ent. soc. London, 1867, ser. 3, **5**, p. 528, ☿, pl. 26, fig. 5.

Type-locality: Borneo.

I refer a female specimen from Kuching (John Hewitt) to this species.

*121. CATAULACUS LATISSIMUS Emery.

Cataulacus latissimus Emery, Rev. Suisse zool., 1893, **1**, p. 215, ☿, pl. 8, fig. 10.

Type-locality: Perak (Bedot and Pictet).

Two workers from Kuching (John Hewitt).

*122. STRUMIGENYS INDAGATRIX, sp. nov.

Worker. Length 1.7 mm.

Slender; head flattened, $1\frac{3}{4}$ times as long as broad, with semicircularly excised posterior border, narrowed at the eyes, the portion anterior to the antennal insertions as long as broad; eyes moderately large and convex. Mandibles about half as long as the head, straight, slender, slightly narrowed at their insertions, with straight, parallel borders, a pair of long, acute, subequal apical teeth and a spiniform preapical tooth of the same shape but somewhat shorter. Clypeus as long as broad, flat, with entire anterior border. Antennae slender; the scapes reaching nearly to the posterior fifth of the head; last funicular joint longer than the remainder of the funiculus; joints 2 and 3 subequal, small, not longer than broad, fourth joint a little longer than the first, about twice as long as the second and third together. Thorax narrow, the profile outline of the pronotum feebly convex, rising to the mesonotum, which is the highest part of the thorax, and descending gradually to the long epinotum, the base of which is nearly straight in profile and fully $1\frac{2}{3}$ times as long as the declivity. The spines are rather long and slender, but indistinct, as each is embedded in a spongiform plate continued down the side of the declivity. Petiole and postpetiole with large spongiform masses on the sides and ventrally, so that only the dorsal surfaces are exposed. Gaster but little broader than its straight, transverse, anterior border. Legs slender.

Mandibles, gaster, and dorsal surface of postpetiole smooth and shining; head, thorax, petiole, legs, and antennae opaque, densely and regularly punctate, the head a little more coarsely than the thoracic dorsum, the appendages very finely. Extreme base of gaster longitudinally rugose.

Hairs yellowish, sparse, rather long, especially at the tip of the gaster, erect or suberect, shorter and blunter on the head, on the clypeus and anterior border of the scape curved but pointed, nonclavate. Legs with very short, subappressed hairs.

Yellowish ferruginous; mandibles and legs paler.

Described from two specimens taken by Mr. John Hewitt at Kuching.

In the shape of the head, mandibles, and antennae this species approaches *S. moesaryi* Emery of Papuasia, but the mandibles are decidedly shorter and the pilosity and arrangement of the spongiform appendages of the petiole are very different. The Bornean species is also related to four Javanese species recently described by Forel (*S. kraepelini, koningsbergi, signeae, and ebbae*), but is smaller than any of them. It can be readily distinguished from *kraepelini* and *koningsbergi* by the well-developed, spiniform, preapical tooth of the mandibles. *S. signeae* possesses a translucent inner border to the mandibles and an emarginate clypeus and in *ebbae* the preapical tooth is only slightly longer than broad, the antennal scapes are shorter, the first funicular joint not longer than broad, the hairs are club-shaped and the color is deep ferruginous.

*123. STRUMIGENYS BRYANTI, sp. nov.

Female. Length, 4.8 mm.

Slender; head fully 1¾ times as long as broad, its posterior border deeply and semicircularly excised, the sides gradually converging to the rather large, convex eyes, the preocular portion 1½ times as long as broad, with subparallel sides; vertex very feebly convex, the posterior lobes depressed and flattened. Mandibles fully ½ as long as the head, straight, flattened, with parallel borders, very slightly narrowed at their insertions, sinuately excised at the inner border just back of the two strong, subequal, spiniform, apical teeth. Preapical tooth absent. Clypeus flattened, as long as broad, its anterior border entire. Antennae very slender; scapes reaching to the posterior fourth of the head; last funicular joint much shorter than the remainder of the funiculus and somewhat longer than the preceding joint, joints 2 and 3 subequal, as long as broad, together a little more than half as long as the first joint. Thorax distinctly narrower than the head, a little more than twice as long as broad, very high and convex in the region of the mesonotum and scutellum, the epinotum low with short horizontal base and long vertical declivity, meeting it at a right angle; spines reduced to rectangular flat teeth, each continued as a translucent, spongiform plate down the side of the declivity. Petiole three times as long as broad, broader behind than in front, with straight sides, the node low and rounded, in profile gradually passing into the peduncle, its posterior border with spongiform appendages and its ventral surface behind with a median spongiform lamella. Postpetiole subcircular, as long as broad, broader than the petiolar node, only its dorsal surface exposed, the remainder embedded in spongiform material, with a long, flat plate of the same substance depending from its midventral line. Gaster small, narrow and straight in front, its anteroventral surface with a broad mass of spongiform material. Legs long and slender. Wings with small pterostigma and almost no veins.

Opaque; mandibles and gaster shining; the gaster longitudinally rugose and reticulate at the base. Remainder of body densely and finely punctate, rugulose, the posterior lobes of the head regularly and more coarsely, the appendages more finely punctate.

Hairs pale yellow; very long, sparse, erect, slender, and pointed, quite as long and conspicuous on the legs as on the body; antennal scapes with short curved, subappressed, pointed hairs, not arranged in a regular row. Head, clypeus, and thorax also with numerous short, appressed, simple hairs, representing a long, dilute pubescence.

Ferruginous brown; mandibles, antennae, legs, and base and tip of gaster paler and more yellowish. Wings yellowish hyaline with dark brown pterostigma.

Described from a single specimen taken by Mr. G. E. Bryant on Mt. Matang, West Sarawak and sent me by Mr. Horace Donisthorpe. In size, in the general shape of the body and its extraordinary pilosity, this species is most closely related to *S. doriae* Emery, described from a worker specimen taken in Amboina. This form, however, has more slender and cylindrical mandibles, so that the Bornean specimen can hardly be the cospecific female.

*124. RHOPALOTHRIX BORNEËNSIS, sp. nov.

Female (deälated). Length, 3.5 mm.

Resembling *Rh. procera* Emery, but smaller and the emarginations of the sides of the head at the eyes and antennal insertions deeper and more sinuous and the border just behind the eyes forming a rounded, rather flattened lobe. The clypeus is distinctly longer, its median portion being prolonged further posteriorly. Thorax decidedly narrower than the head, the pronotum laterally compressed, deeply and angularly excised behind. Mesonotum flattened above, grooved in the middle, but not carinate anteriorly. Scutellum and epinotum very small, the former gibbous, overhanging the latter, which has a pair of acute, flattened teeth as long as broad at their bases. Petiolar node subrectangular when seen from above, as long as broad; feebly longitudinally impressed in the middle. Postpetiole 2½ times as broad as the petiole, much broader than long, with broadly concave anterior and broadly convex posterior border, the dorsal surface with a feeble median sulcus in front and a large round impression behind. Gaster with a faint median sulcus.

Opaque; densely and finely punctate-rugulose; gaster and postpetiole evenly punctate; antennal scrobes and mesopleurae shining.

Head, legs, and dorsal surface of body covered with dirty white, flattened, appressed, scale-like hairs, fine and numerous on the clypeus and mandibles, long and conspicuous on the external borders of the antennal scapes, tibiae, and tarsi, absent on the pleurae and lateral surfaces of the coxae.

Ferruginous brown; appendages scarcely paler.

Described from a single specimen taken by Mr. John Hewitt at Kuching in 1908 "in an old fungus."

Additional material may show that this is merely a small subspecies of *Rh. procera* Emery of New Guinea. The female of this form measures 5 mm. and has the petiolar node broader than long. *Rh. borneënsis* seems also to be more opaque than *procera*, but Emery's description of the female is very brief.

DOLICHODERINAE.

125. DOLICHODERUS (HYPOCLINEA) BITUBERCULATUS (Mayr).

Hypoclinea bituberculata Mayr, Verh. Zool. bot. gesellsch. Wien., 1862, **12**, p. 705, ☿.

Dolichoderus bituberculatus Emery, Ann. Mus. civ. Genova, 1887, ser. 2, **4**, p. 254, ☿ ♀.

Hypoclinea sellaris Roger, Berl. ent. zeitschr., 1863, **7**, p. 168, 213, ☿.

Dolichoderus (*Hypoclinea*) *bituberculatus* Emery, Gen. Ins. Dolichod., 1912, p. 10.

Type-locality: Luzon Island, Philippines.

Sarawak (Doria and Beccari; Bedot and Pictet); Kapouas Basin (Chaper); Bandjermassin (Fritz Suck).

Numerous workers from British North Borneo (E. B. Kershaw) and from Serambu Mt., Sarawak (H. W. Smith). A deälated female and five workers from Kuching (John Hewitt) are of a more reddish color.

125a. DOLICHODERUS (HYPOCLINEA) BITUBERCULATUS var. BORNEONENSIS (Roger).

Hypoclinea sellaris var. *borneonensis* Roger, Berl. ent. zeitschr., 1863, **7**, p. 214, ☿.

Type-locality: Borneo.

126. DOLICHODERUS (HYPOCLINEA) CONIGER Mayr.

Hypoclinea conigera Mayr, Verh. Zool. bot. gesellsch. Wien, 1870, **20**, p. 956, ☿.

Dolichoderus (*Hypoclinea*) *coniger* Emery, Gen. Ins. Dolichod., 1912, p. 13.

Type-locality: Sarawak, Borneo (Doria and Beccari).

A single worker from Mt. Matang, West Sarawak (John Hewitt).

127. DOLICHODERUS (HYPOCLINEA) CUSPIDATUS (Smith).

Polyrhachis cuspidatus Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 63, ☿.

Hypoclinea cuspidata Mayr, Verh. Zool. bot. gesellsch. Wien, 1870, **20**, p. 955, ☿.

Dolichoderus cuspidatus Emery, Ann. Mus. civ. Genova, 1887, ser. 2, **4**, p. 256, ☿.

Dolichoderus (*Hypoclinea*) *cuspidatus* Emery, Gen. Ins. Dolichod., 1912, p. 13.

Type locality: Sarawak, Borneo (A. R. Wallace).

Sarawak (Doria and Beccari).

Several workers from Mt. Matang and the Rambungan River, Sarawak (H. W. Smith).

128. DOLICHODERUS (HYPOCLINEA) PATENS (Mayr).

Hypoclinea patens Mayr, Verh. Zool. bot. gesellsch. Wien, 1870, **20**, p. 957, ☿.

Dolichoderus patens Emery, Ann. Mus. civ. Genova, 1887, ser. 2, **4**, p. 254.

Dolichoderus (*Hypoclinea*) *patens* Emery, Gen. Ins. Dolichod., 1912, p. 14.

Type-locality: Sarawak, Borneo (Doria and Beccari).

129. DOLICHODERUS (HYPOCLINEA) SEMIRUGOSUS (Mayr).

Hypoclinea semirugosa Mayr, Verh. Zool. bot. gesellsch. Wien, 1870, **20**, p. 956, ☿.

Dolichoderus semirugosus Emery, Ann. Mus. civ. Genova, 1887, ser. 2, **4**, p. 254, ☿.

Dolichoderus (*Hypoclinea*) *semirugosus* Emery, Gen. Ins. Dolichod., 1912, p. 14.

Type-locality: Sarawak, Borneo (Doria and Beccari).

130. DOLICHODERUS (HYPOCLINEA) SULCATICEPS (Mayr).

Hypoclinea sulcaticeps Mayr, Verh. Zool. bot. gesellsch. Wien, 1870, **20**, p. 957, ☿.

Dolichoderus sulcaticeps Emery, Ann. Mus. civ. Genova, 1887, ser. 2, **4**, p. 254, ☿.

Dolichoderus (*Hypoclinea*) *sulcaticeps* Emery, Gen. Ins. Dolichod., 1912, p. 14.

Type-locality: Sarawak, Borneo (Doria and Beccari).
Several workers from Sadong, Sarawak (H. W. Smith).

*131. DOLICHODERUS (HYPOCLINEA) TAPROBANAE (Smith).

Formica taprobane Smith, Cat. Hymenop. Brit. mus., 1858, **6**, p. 13, ♀.
Dolichoderus taprobanae Mayr, Verh. Zool. bot. gesellsch. Wien, 1886, **36**, p. 353.
Hypoclinea gracilis Motschulsky, Bull. Soc. nat. Moscou, 1863, **36**, p. 14, ☿.
Dolichoderus (*Hypoclinea*) *taprobanae* Emery, Gen. Ins. Dolichod., 1912, p. 14.

Type-locality: Ceylon.
Two workers from Kuching (John Hewitt).

131a. DOLICHODERUS (HYPOCLINEA) TAPROBANAE (Smith) var. BORNEËNSIS Forel.

Dolichoderus taprobanae var. *borneënsis* Forel, Rev. Suisse zool., 1911, **19**, p. 46, ☿.
Dolichoderus (*Hypoclinea*) *taprobanae* var. *borneënsis* Emery, Gen. Ins. Dolichod., 1912, p. 14.

Type-locality: Hayvep, Borneo (Winkler).

132. IRIDOMYRMEX ANCEPS (Roger).

Formica anceps Roger, Berl. ent. zeitschr., 1863, **7**, p. 164, ☿.
Iridomyrmex excisus Mayr, Tijdschr. ent., 1867, **10**, p. 77, ☿ ♀, pl. 2, fig. 8.
Hypoclinea (*Iridomyrmex*) *excisa* Mayr, Verh. Zool. bot. gesellsch. Wien, 1870, **20**, p. 959, ☿.
Iridomyrmex anceps Emery in Dalla Torre, Cat. Hymenop., 1893, **7**, p. 169; Emery, Gen. Ins. Dolichod., 1912, p. 23.

Type-locality: Malacca.
Sarawak (Doria and Beccari).
Several workers and three females from Kuching (John Hewitt).

133a. IRIDOMYRMEX CORDATUS (Smith) subsp. PROTENSUS Forel.

Iridomyrmex cordatus subsp. *protensus* Forel, Rev. Suisse zool., 1911, **19**, p. 47, ☿ ♀ ♂; Emery, Gen. Ins. Dolichod., 1912, p. 24.

Type-locality: Sarawak, Borneo (Haviland).

*134a. IRIDOMYRMEX MYRMECODIAE Emery.

Iridomyrmex cordatus var. *myrmecodiae* Emery, Ann. Mus. civ. Genova, 1887, ser. 2, **4**, p. 249, ☿.
Iridomyrmex myrmecodiae Emery, ibid., 1900, ser. 2, **20**, p. 694; Emery, Gen. Ins. Dolichod., 1912, p. 25.

Type-locality: Java.

Numerous workers from British North Borneo (E. B. Kershaw) and a deälated female and two workers from Kuching (John Hewitt), found nesting in the rootstocks of a fern (*Polypodium sinuosus sinuosus*).

135. TAPINOMA FLAVIDUM Ern. André.

Tapinoma flavidum Ern. André, Mém. Soc. zool. France, 1892, **5**, p. 51, ☿; Emery, Gen. Ins. Dolichod., 1912, p. 41.

Type-locality: Kapouas Basin, Borneo (Chaper).

136. TAPINOMA MELANOCEPHALUM (Fabricius).

Formica melanocephala Fabricius, Ent. syst., 1793, **2**, p. 353, ♀.
Lasius melanocephalus Fabricius, Syst. Piez., 1804, p. 417.
Myrmica melanocephala Lepeletier, Hist. nat. ins. hyménop., 1836, **1**, p. 185.
Formica nana Jerdon, Madras Journ. lit. sci., 1851, **17**, p. 125, ☿.
Micromyrma melanocephala Roger, Berl. ent. zeitschr., 1862, **6**, p. 258, ☿ ♀.
Myrmica pellucida Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 71, ☿.
Formica familiaris Smith, ibid., Suppl., 1860, **4**, p. 96 (*nec.* ibid., p. 68, ♀).
Tapinoma melanocephalum Mayr, Verh. Zool. bot. gesellsch. Wien, 1862, **12**, p. 651; Emery, Gen. Ins. Dolichod., 1912, p. 41.

Type-locality: Cayenne (Coll. Bosc.).
Kapouas Basin (Chaper).

*137. TAPINOMA INDICUM Forel.

Tapinoma melanocephalum var. Mayr, Termesz. füzetek., 1897, **20**, p. 432, ☿.
Tapinoma indicum Forel, Journ. Bombay nat. hist. soc., 1895, **9**, p. 472, ☿; Bingham, Fauna Brit. India. Hymenop., 1903, **2**, p. 304, ☿; Emery, Gen. Ins. Dolichod., 1912, p. 41.

Tapinoma melanocephalum subsp. *indicum* Forel, Notes Leyden mus., 1911, **33**, p. 206.

Type-locality: Poona, India (Wroughton).
Several workers from Sarawak (Roland Thaxter).

138. Technomyrmex albipes (Smith).

Formica (*Tapinoma*) *albipes* Smith, Journn. Proc. Linn. soc. London. Zool., 1861, **6**, p. 38, ☿.
Tapinoma albipes Mayr, Ann. Mus. civ. Genova, 1872, **2**, p. 147; Emery, ibid., 1887, ser. 2, **4**, p. 249.
Technomyrmex albipes Emery, Zeitschr. wiss. zool., 1888, **46**, p. 392; Emery, Gen. Ins. Dolichod., 1912, p. 43.

Type-locality: Tondano, Celebes (A. R. Wallace).
Sarawak (Doria and Beccari); Kapouas Basin (Chaper).
Several workers from Sarawak (H. W. Smith) and one from Kuching (John Hewitt).

139. Technomyrmex strenuus Mayr.

Technomyrmex strenua Mayr, Ann. Mus. civ. Genova, 1872, **2**, p. 147, ☿ ♀.
Technomyrmex strenuus Emery, ibid., 1887, ser. 2, **4**, p. 248, ☿; Emery, Gen. Ins. Dolichod., 1912, p. 44, ☿ ♀, pl. 1, fig. 20, 20b.

Type-locality: Sarawak, Borneo (Doria and Beccari).
Sarawak (Haviland).
Four workers from Kuching (John Hewitt).

Camponotinae.

140. Myrmoteras donisthorpei Wheeler.

Myrmoteras donisthorpei Wheeler, Proc. New Eng. zool. club, 1916, **6**, p. 14, ♀, fig. 3.

Type-locality: Mt. Matang, West Sarawak (G. E. Bryant).

141. Plagiolepis (Anoplolepis) longipes (Jerdon).

Formica longipes Jerdon, Madras Journ. lit. sci., 1851, **17**, p. 122, ☿.
Formica gracilipes Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 55, ☿.

Formica trifasciata Smith, Cat. Hymenop. Brit. mus., 1858, **6**, p. 27, ♀.
Prenolepis gracilipes Mayr, Verh. Zool. bot. gesellsch., Wien, 1862, **12**, p. 698.
Plagiolepis gracilipes Mayr, Tijdschr. ent., 1867, **10**, p. 73, ☿ ♀.
Plagiolepis longipes Emery, Ann. Mus. civ. Genova, 1887, ser. 2, **4**, p. 247.
Plagiolepis (*Anoplolepis*) *longipes* Forel, Tijdschr. ent., 1915, **58**, p. 34.

Type-locality: India (Jerdon).

Sarawak (Doria and Beccari; Bedot and Pictet); Kapouas Basin (Chaper).

Numerous workers from Sandakan, Sadong and Mt. Matang, Sarawak (H. W. Smith), British North Borneo (E. B. Kershaw) and Kuching (John Hewitt).

142. APHOMOMYRMEX ANDREI (Emery).

Dimorphomyrmex andrei Emery, Ann. Soc. ent. France, 1894, p. 73, ♀.
Aphomomyrmex andrei Emery, Ann. Soc. ent. Belgique, 1899, **43**, p. 894, ♀; Wheeler, Psyche, 1910, **17**, p. 132, ♀.

Type-locality: Pulo Laut, Borneo.

143. APHOMOMYRMEX HEWITTI Wheeler.

Aphomomyrmex hewitti Wheeler, Psyche, 1910, **17**, p. 132, ☿ ♀, fig. 1.

Type-locality: Bidi, Borneo (John Hewitt).

144. GESOMYRMEX CHAPERI Ern. André.

Gesomyrmex chaperi Ern. André, Mém. Soc. zool. France, 1892, **5**, p. 47, ☿. fig. 1–3.

Type-locality: Kapouas Basin, Borneo (Chaper).

145. DIMORPHOMYRMEX JANETI Enr. André.

Dimorphomyrmex janeti Ern. André, Mém. Soc. zool. France, 1892, **5**, p. 51, ☿, fig. 4, 5; Wheeler, Psyche, 1910, **17**, p. 132, ☿.

Type-locality: Kapouas Basin, Borneo (Chaper).

*146. Prenolepis jerdoni Emery.

Prenolepis jerdoni Emery, Rev. Suisse zool., 1893, **1**, p. 223, ☿, pl. 8, fig. 20.

Type-locality: Perak.
Three workers from Kuching (John Hewitt).

*147. Prenolepis (Nylanderia) longicornis (Latreille).

Formica longicornis Latreille, Hist. nat. fourmis, 1802, p. 113, ☿.
Formica vagans Jerdon, Madras Journ. lit. sci., 1851, **17**, p. 124, ☿ ♀.
Formica (Tapinoma) gracilescens Nylander, Ann. sci. nat. Zool., 1856, ser. 4, **5**, p. 73, ☿, pl. 3, fig. 20.
Formica gracilescens Nylander, Ann. Soc. ent. France, 1856, ser. 3, **4**, Bull., p. XXVIII, ☿.
Tapinoma gracilescens Smith, Cat. Hymenop. Brit. mus., 1858, **6**, p. 56.
Prenolepis gracilescens Mayr, Verh. Zool. bot. gesellsch. Wien, 1862, **12**, p. 698.
Paratrechia currens Motschulsky, Bull. Soc. nat. Moscou, 1863, **36**, p. 14.
Prenolepis longicornis Roger, Verzeichn. formicid., 1863, p. 10.
Prenolepis (Nylanderia) longicornis Santschi, Voy. Allmand et Jeamel Afr. Orient. Formicid., 1914, p. 127, ☿.

Type-locality: Senegal (Bosc.).
Seven workers from Sarawak (Roland Thaxter).

148. Prenolepis (Nylanderia) obscura Mayr.

Prenolepis obscura Mayr, Verh. Zool. bot. gesellsch. Wien, 1862, **12**, p. 698, ☿ ♀.

Type-locality: Sydney, New South Wales (Novara Expedition).
Kapouas Basin, Borneo (Chaper).

*149. Prenolepis (Nylanderia) kraepelini Forel.

Prenolepis kraepelini Forel, Mitth. Naturh. mus. Hamburg, 1905, **22**, p. 24, ☿ ♀ ♂.

Type-locality: Buitenzorg, Java (Kraepelin).

Two workers from Kuching (John Hewitt), "nesting in fungus," and one from Sarawak (Roland Thaxter). Another worker from Mt. Matang (G. E. Bryant) appears to belong to the same species but is considerably larger (2.6 mm.).

150a. PRENOLEPIS (NYLANDERIA) BUTTELI Forel subsp. BRYANTI Forel.

Prenolepis (*Nylanderia*) *butteli* Forel subsp. *bryanti* Forel, Rev. Suisse zool. 1916, **24**, p. 439, ☿.

Type-locality: Mt. Matang, West Sarawak (G. E. Bryant).

Worker. Length 1.5 mm.

Head subrectangular, as broad as long, nearly as broad in front as behind with rounded sides and posterior corners and feebly convex posterior border. Eyes moderately large, flat, just behind the middle of the sides. Mandibles narrow, with straight external and short, minutely 5-toothed apical borders. Clypeus very convex, but not carinate, its anterior border entire and rounded. Frontal carinae short, as far apart as their distance from the sides of the head. Antennae slender, scapes extending about $\frac{1}{6}$ their length beyond the occipital border of the head; second funicular joint small, broader than long, joints 3–6 a little longer than broad. Thorax short, with distinct promesonotal and mesoëpinotal sutures, very feeble and short mesoëpinotal constriction, the pro- and mesonotum rather flat; the epinotum with very short and transverse, feebly convex base, passing rapidly into the long sloping declivity. Petiole with very short, low node, a mere anteriorly directed projection at the anterior end of the segment, much as in some species of Tapinoma. Gaster with the first segment concave in front and lying over the petiole.

Head and thorax subopaque; mandibles, legs, antennae, and gaster more shining; mandibles sparsely and finely punctate; the head, thorax, and gaster distinctly shagreened, the gaster transversely.

Hairs dark brown, coarse, sparse, erect, blunt, except on the anterior portion of the head; body without, antennae and legs with extremely short, appressed, whitish pubescence.

Castaneous brown; head, thorax, and gaster with pronounced metallic reflections, the head and pronotum more blue, the gaster and remainder of the thorax more violet. Mandibles, antennae, tarsi, middle and hind tibiae, knees, and ends of tibiae of fore legs, and tips of hind femora whitish yellow.

A single specimen from Sarawak, received from Prof. Roland Thaxter.

Forel's description is very brief and is hidden away in the midst of a paper devoted to Congolese ants!

151. PSEUDOLASIUS MAYRI Emery.

Lasius familiaris Mayr, Reise Novara. Zool., **2**. Formicid., 1865, p. 55, ♀ (*nec* Smith).

Pseudolasius familiaris Emery, Ann. Mus. civ. Genova, 1887, ser. 2, **4**, p. 245, *nota*, ☿ (*nec* Smith *nec* ♀).
Pseudolasius mayri Emery, Ann. Soc. ent. Belgique, 1911, **55**, p. 215, ☿ ♀ ♂.

Type-locality: Buitenzorg, Java.
Sarawak (Coll. Emery).

151a. Pseudolasius mayri var. sarawakanus Forel.

Pseudolasius mayri var. *sarawakana* Forel, Zool. jahrb. Syst., 1913, **36**, p. 107 *nota*, ♀ ♂.

Type-locality: Sarawak, Borneo (Haviland).

152. Oecophylla smaragdina (Fabricius).

Formica smaragdina Fabricius, Syst. ent., 1775, p. 828, ♀.
Formica macra Guérin, Duperry Voy. Coquille. Zool., 1830, **2**, p. 202, ☿, pl. 8, fig. 1.
Formica zonata Guérin, ibid., p. 205, ♀.
Oecophylla smaragdina Smith, Journ. Proc. Linn. soc. London. Zool. Suppl., 1860, **4**, p. 102, ☿.

Type-locality: India (Edler).
Sarawak (Doria and Beccari; Bedot and Pictet; A. R. Wallace).

Numerous workers from British North Borneo (E. B. Kershaw); and a deälated female and workers from Kuching and Sadong (H. W. Smith).

153. Calomyrmex laevissimus (Smith).

Formica laevissima Smith, Journ. Proc. Linn. soc. London. Zool., 1859, **3**, p. 138, ☿.
Camponotus laevissimus Mayr, Tijdschr. ent., 1867, **10**, p. 39, ☿, pl. 2, fig. 1.
Colobopsis levissima Roger, Verzeich. formicid., 1863, p. 10.
Calomyrmex laevissimus Emery, Mem. R. accad. sci. Bologna, 1896, 1895-1896, ser. 5, **5**, p. 776.

Type-locality: Aru (A. R. Wallace).
Borneo (*teste* Roger).

154. Camponotus (Dinomyrmex) gigas (Latreille).

Formica gigas Latreille, Hist. nat. fourmis, 1802, p. 105, ♀, pl. 2, fig. 6.
Camponotus gigas Mayr, Verh. Zool. bot. gesellsch. Wien, 1862, **12**, p. 669, ☿.
Camponotus (*Dinomyrmex*) *gigas* Forel, Rev. Suisse zool., 1914, **22**, p. 268.

Type-locality: "Grandes-Indes" (Riche).

Several workers from British North Borneo (E. B. Kershaw) and from the Silimpopon River (Hugh M. Smith).

154a. Camponotus (Dinomyrmex) gigas subsp. borneënsis Emery.

Camponotus gigas subsp. *borneënsis* Emery, Ann. Mus. civ. Genova, 1887, ser. 2, 4, p. 214, ☿ ♀ ♂.

Type-locality: Sarawak, Borneo (Doria and Beccari).

Kapouas Basin (Chaper); Poeloe Island, E. Borneo (P. Jachan).

Numerous workers from Kuching, Sadong, and the Rambungan River, Sarawak (H. W. Smith) and a single worker from Kuching (John Hewitt).

155. Camponotus (Dinomyrmex) angusticollis (Jerdon).

Formica angusticollis Jerdon, Madras Journ. lit. sci., 1851, **17**, p. 120, ☿ ♀.
Formica ardens Smith, Cat. Hymenop. Brit. mus., 1858, **6**, p. 17, ♀.
Formica impetuosa Smith, ibid., p. 18, ☿.
Formica callida Smith, ibid., p. 18, ☿.
Camponotus prismaticus Mayr, Verh. Zool. bot. gesellsch. Wien, 1862, **12**, p. 669, ☿.
Camponotus angusticollis Roger, Verzeichn. formicid., 1863, p. 3; Dalla Torre, Cat. Hymenop., 1893, **7**, p. 221.
Camponotus ardens Mayr, Verh. Zool. bot. gesellsch. Wien, 1886, **36**, p. 353.
Camponotus (*Dinomyrmex*) *angusticollis* Forel, Rev. Suisse zool., 1914, **22**, p. 268.

Type-locality: Malabar, Southern India (Jerdon).

Borneo (Mus. Caes.).

156. Camponotus (Myrmoturba) festinus (Smith).

Formica festina Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 53, ♀.
Camponotus festinus Roger, Verzeich. formicid., 1863, p. 3; Dalla Torre, Cat. Hymenop., 1893, **7**, p. 231.
Camponotus (*Myrmoturba*) *festinus* Forel, Rev. Suisse zool., 1914, **22**, p. 267.

Type-locality: Sarawak, Borneo (A. R. Wallace).

Sarawak (Doria and Beccari; Bedot and Pictet).

Two major workers and one minor from Kuching (John Hewitt), one major from British North Borneo (E. B. Kershaw) and a minor from Sadong, Sarawak (H. W. Smith) agree in measurements with the type of this species as defined by Emery. Smith unfortunately based the species on a female, so that, as Emery says, examination of the type would probably give no clue as to whether it belonged to this form or to the subspecies described by the Italian myrmecologist as subsp. *eximius* from Sumatra.

*156a. CAMPONOTUS (MYRMOTURBA) FESTINUS subsp. EXIMIUS Emery.

Camponotus festinus subsp. *eximius* Emery, Ann. Mus. civ. Genova, 1900, ser. 2, **20**, p. 701, ☿.

Type-locality: Si Rambe, Sumatra (E. Modigliani).

A single worker major from Kuching (John Hewitt).

*157. CAMPONOTUS (MYRMOTURBA) AUTRANI Forel.

Camponotus autrani Forel, Ann. Soc. ent. Belgique, 1886, **30**, p. 165, ☿.
Camponotus festinus subsp. *autrani* Emery, Ann. Mus. civ. Genova, 1888, ser. 2, **5**, p. 528, ☿.
Camponotus (*Myrmoturba*) *autrani* Forel, Rev. Suisse zool., 1914, **22**, p. 266.

Type-locality: Sumatra (Conrad Klaesi).

Two major workers from Sadong, Sarawak (H. W. Smith).

158. CAMPONOTUS (MYRMOTURBA) SUCKI Forel.

Camponotus sucki Forel, Mitth. Naturh. mus. Hamburg, 1901, **18**, p. 71, ☿.
Camponotus (*Myrmoturba*) *sucki* Forel, Rev. Suisse zool., 1914, **22**, p. 267.

Type-locality: Tandjong, S. E. Borneo (Fritz Suck).

159a. CAMPONOTUS (MYRMOTURBA) MACULATUS Fabricius subsp. SETITIBIA Forel.

Camponotus maculatus race *setitibia* Forel, Mitth. Naturh. mus. Hamburg, 1901, **18**, p. 68, ☿.

Type-locality: Tandjong, S. E. Borneo (Fritz Suck).

159b. CAMPONOTUS (MYRMOTURBA) MACULATUS subsp. IRRITANS (Smith).

Formica irritans Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 55, ☿.
Camponotus irritans Roger, Verzeichn. formicid., 1863, p. 3.
Camponotus inconspicuus Mayr, Ann. Mus. civ. Genova, 1872, **2**, p. 135, ☿.
Camponotus (Myrmoturba) maculatus subsp. *irritans* Forel, Rev. Suisse zool., 1914, **22**, p. 267.

Type-locality: Sarawak, Borneo (A. R. Wallace).
Sarawak (Doria and Beccari; Bedot and Pictet).
Numerous workers and a female from Kuching (H. W. Smith).

159c. CAMPONOTUS (MYRMOTURBA) MACULATUS subsp. IRRITANS var. INFERIOR Forel.

Camponotus maculatus subsp. *irritans* var. *inferior* Forel, Rev. Suisse zool., 1911, **19**, p. 48, ☿ ♀.

Type-locality: Sarawak, Borneo (Haviland).
Several workers from Kuching (John Hewitt).

159d. CAMPONOTUS (MYRMOTURBA) MACULATUS subsp. COMPRESSUS (Fabricius).

Formica compressa Fabricius, Mant. Ins., 1787, **1**, p. 307, ☿.
Formica indefessa Sykes, Trans. Ent. soc. London, 1835, **1**, p. 104, ☿, pl. 13, fig. 3.
Camponotus compressus Roger, Verzeichn. formicid., 1863, p. 2.
Camponotus quadrilaterus Roger, Berl. ent. zeitschr., 1863, **7**, p. 136, ☿.
Camponotus maculatus subsp. *compressus* Emery, in Dalla Torre, Cat. Hymenop., 1893, **7**, p. 226.

Type-locality: Tranquebar (Hybner).
Sarawak (A. R. Wallace).

160. CAMPONOTUS (MYRMOTURBA) PALLIDUS (Smith).

Formica pallida Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 57, ☿.
Camponotus pallidus Mayr, Verh. Zool. bot. gesellsch. Wien, 1863, **13**, p. 400; Forel, Journ. Bombay nat. hist. soc., 1892, **7**, p. 21, ☿; Emery, Mem. R. accad. sci. Bologna, 1896, 1895–1896, ser. 5, **5**, p. 769.

Type-locality: Sarawak, Borneo (A. R. Wallace).

Sarawak (Doria and Beccari); Kapouas Basin (Chaper).

A single worker from Kuching (John Hewitt) from a colony "nesting in a bunch of ratan fruits."

161. CAMPONOTUS (MYRMOTURBA?) FERVENS (Smith).

Formica fervens Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 55, ☿.
Camponotus fervens Mayr, Verh. Zool. bot. gesellsch. Wien, 1886, **36**, p. 354.
Camponotus (*Myrmoturba?*) *fervens* Forel, Rev. Suisse zool., 1914, **22**, p. 267.

Type-locality: Sarawak, Borneo (A. R. Wallace).

162. CAMPONOTUS (MYRMOTARSUS) MISTURA (Smith).

Formica mistura Smith, Journ. Proc. Linn. soc. London, Zool., 1857, **2**, p. 53, ♀.
Formica exasperata Smith, ibid., p. 56, ☿.
Camponotus exasperatus Mayr, Verh. Zool. bot. gesellsch. Wien, 1862, **12**, p. 659, ☿.
Camponotus mistura Mayr, ibid., 1886, **36**, p. 354.
Camponotus (*Myrmotarsus*) *mistura* Forel, Rev. Suisse zool., 1914, **22**, p. 269.

Type-locality: Sarawak, Borneo (A. R. Wallace).

Sarawak (Doria and Beccari; Haviland).

A female from British North Borneo (E. B. Kershaw) and one from Kuching (H. W. Smith).

163. CAMPONOTUS (MYRMOTARSUS) RUFIFEMUR Emery.

Camponotus rufifemur Emery, Ann. Mus. civ. Genova, 1900, ser. 2, **20**, p. 705, ☿.
Camponotus (*Myrmotarsus*) *rufifemur* Forel, Rev. Suisse zool., 1914, **22**, p. 269.

Type-locality: Mentawei (E. Modigliani).

Sarawak, Borneo.

A major worker from Kuching (John Hewitt) and a major and minor worker from the Rambungan River (H. W. Smith).

164. CAMPONOTUS (MYRMOTARSUS) PRESSIPES Emery.

Camponotus pressipes Emery, Ann. Soc. ent. France, 1893, p. 268 *nota*, ♀.
Camponotus (*Myrmotarsus*) *pressipes* Forel, Rev. Suisse zool., 1914, **22**, p. 269.

Type-locality: Borneo.

Tandjong, S. E. Borneo (Fritz Suck).

Three females from Kuching (H. W. Smith).

165. CAMPONOTUS (MYRMOTARSUS) IRRITABILIS (Smith).

Formica irritabilis Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 56, ☿.
Camponotus irritabilis Roger, Verzeichn. formicid., 1863, p. 3.
Camponotus (Myrmotarsus) irritabilis Forel, Rev. Suisse zool., 1914, **22**, p. 269.

Type-locality: Sarawak, Borneo (A. R. Wallace).

Sarawak (Doria and Beccari).

Several workers from Kuching (John Hewitt) and the Rambungan River, Sarawak (H. W. Smith) and a single worker transitional to the var. *sedulus* from British North Borneo (E. B. Kershaw).

165a. CAMPONOTUS (MYRMOTARSUS) IRRITABILIS var. SEDULUS (Smith).

Formica sedula Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 56, ☿.
Camponotus sedulus Mayr, Ann. Mus. civ. Genova, 1872, **2**, p. 136, ☿ ♀.
Camponotus irritabilis var. *sedulus* Forel, Rev. Suisse zool., 1911, **19**, p. 51.

Type-locality: Sarawak, Borneo (A. R. Wallace).

Four major workers from the Rambungan River, Sarawak (H. W. Smith).

165b. CAMPONOTUS (MYRMOTARSUS) IRRITABILIS var. WINKLERI Forel.

Camponotus irritabilis var. *winkleri* Forel, Rev. Suisse zool., 1911, **19**, p. 51, ☿.

Type-locality: Hayvep, Borneo (Winkler).

166. CAMPONOTUS (MYRMOPHYMA) QUADRISECTUS (Smith).

Formica quadrisecta Smith, Cat. Hymenop. Brit. mus., 1858, **6**, p. 28, ♀.
Camponotus gilviceps Mayr, Tijdschr. ent. 1867, **10**, p. 5, ☿.
Camponotus quadrisectus Forel, Ann. Soc. ent. Belgique, 1909, **53**, p. 57 *nota.*
Camponotus (Myrmophyma) quadrisectus Forel, Rev. Suisse zool., 1914, **22**, p. 269.

Type-locality: Philippine Islands.

Borneo (Leyden Mus.).

A soldier and two minor workers from Baram, Borneo (John Hewitt) taken from the "distorted pseudobulb of a Myrmecodia."

Forel assigns this species to his subgenus Myrmophyma, of which he has designated it as the type, but it seems to me to belong more naturally in Myrmotarsus, owing to the peculiar compression of the hind metatarsi and the shape of the head. Emery had previously (Mem. R. accad. sci. Bologna, 1896, ser. 5, **5**, p. 773) placed the species in his manipulus 11 of Camponotus with *mistura* Roger, *platypus* Roger, etc.

167. CAMPONOTUS (MYRMOPHYMA) EXSECTUS Emery.

Camponotus exsectus Emery, Ann. Mus. civ. Genova, 1900, ser. 2, **20**, p. 709, fig. 15, ☿ ♀.

Type-locality: Sipora, Mentawei (E. Modigliani).

Pulo Laut, Borneo (Coll. Emery).

168. CAMPONOTUS (MYRMOMALIS) CONTRACTUS Mayr.

Camponotus contractus Mayr, Ann. Mus. civ. Genova, 1872, **2**, p. 137, ☿.

Camponotus (Myrmomalis) contractus Forel, Rev. Suisse zool., 1914, **22**, p. 271.

Type-locality: Sarawak, Borneo (Doria and Beccari).

169a. CAMPONOTUS (MYRMAMBLYS) RETICULATUS Roger subsp. BEDOTI Emery.

Camponotus bedoti Emery, Rev. Suisse zool., 1893, **1**, p. 196, ☿, pl. 8, fig. 2.

Camponotus reticulatus subsp. *yerburyi* var. *bedoti* Emery, Mem. R. accad. sci. Bologna, 1896, 1895–1896, ser. 5, **5**, p. 772.

Camponotus (Myrmamblys) reticulatus subsp. *bedoti* Forel, Rev. Suisse zool., 1914, **22**, p. 271.

Type-locality: Batjan.

Sarawak (Bedot and Pictet).

170. CAMPONOTUS (MYRMOSPHINCTA) CAMELINUS (Smith).

Formica camelina Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 57 ☿.

Camponotus senilis Mayr, Verh. Zool. bot. gesellsch. Wien, 1862, **12**, p. 675, ☿, pl. 19, fig. 3.
Camponotus camelinus Roger, Verzeichn. formicid., 1863, p. 3.
Camponotus singularis var. *camelinus* Emery, Ann. Mus. civ. Genova, ser. 2, **4**, 1887, p. 210.
Camponotus cinerascens var. *camelinus* Dalla Torre, Cat. Hymenop., 1893, **7**, p. 224.
Camponotus (*Myrmosphincta*) *camelinus* Forel, Mem. Soc. ent. Belgique, 1912, **20**, p. 92.
Camponotus (*Myrmocamelus*) *camelinus* Forel, Rev. Suisse Zool., 1914, **22**, p. 270.

Type-locality: Singapore (A. R. Wallace).

Kapouas Basin, Borneo (Chaper).

Numerous workers from British North Borneo (E. B. Kershaw) and Serambu Mt., Sarawak (H. W. Smith).

170a. CAMPONOTUS (MYRMOSPHINCTA) CAMELINUS var. SINGULARIS (Smith).

Formica singularis Smith, Cat. Hymenop. Brit. mus., 1858, **6**, p. 27, ☿.
Camponotus cinerascens Roger, Verzeich. formicid., 1863, p. 3; Dalla Torre, Cat. Hymenop. 1893, **7**, p. 224; Emery, Mem. R. accad. sci. Bologna, 1896, 1895–1896, ser. 5, **5**, p. 771.
Camponotus singularis Mayr, Tijdschr. ent., 1867, **10**, p. 39, ☿.

Type-locality: Java.

Sarawak (Doria and Beccari).

A worker from Matang Mt., W. Sarawak (H. W. Smith) and one from Kuching (John Hewitt).

171. CAMPONOTUS (MYRMOSPHINCTA) DOLICHODEROIDES Forel.

Camponotus dolichoderoides Forel, Rev. Suisse zool., 1911, **19**, p. 51, ☿.
Camponotus (*Myrmosphincta*) *dolichoderoides* Forel, Rev. Suisse zool., 1914, **22**, p. 273.

Type-locality: Hayvep, Borneo (Winkler).

172. CAMPONOTUS (MYRMOSPHINCTA) HYPOCLINEOIDES, sp. nov.

Worker minor. Length 5.3 mm.

Slender; head nearly 1⅓ times as long as broad, with the sides in front of the moderately large and convex eyes, which are just anterior to the posterior third of the head, rather straight and parallel, behind the eyes gradually contracted to a narrow, marginate, but not colliform posterior border; in profile very convex above and flat below. Mandibles narrow, feebly convex, with straight external borders, their apical borders apparently 6-toothed. Both the maxillary and labial palpi very long. Clypeus subcarinate behind, its median portion trapezoidal, a little broader than long, its lateral portions very narrow and reaching to the anterior corners of the head, its anterior border straight and entire. Clypeal foveae small and deep. Frontal area large, semicircular, rather indistinct. Frontal carinae sigmoidal, at their greatest curvature fully as far apart as their distance from the lateral borders of the head. Antennae long and slender, inserted well behind the clypeal border, the nearly straight scapes extending about half their length beyond the occipital border of the head. Thorax shaped like that of Hypoclinea, broadest through the pronotum which, including the neck, is as long as broad, evenly rounded and convex above; mesonotum broadly and deeply constricted behind, the anterior dorsal outline in profile falling rather steeply with an even curve from the pronotum to the depression in which lie the two very prominent metathoracic stigmata. Epinotum about as broad as the mesonotum, only a little lower than the pronotum, with subequal base and declivity, the former longitudinally and transversely rounded, rising rather steeply in front and meeting the latter at a right angle which is neither sharp nor marginate. Petiole narrow, as long as high, the node at its anterior end, erect and very blunt and rounded, lower than the epinotum. Gaster elliptical. Legs long and slender, distinctly compressed, tibiae without bristles on their flexor surfaces.

Shining; mandibles subopaque, very finely and sparsely punctate; gaster transversely alutaceous, with sparse, piligerous punctures.

Hairs long, erect, rather abundant, in part very long and flexuous on the dorsal surface of the head, thorax, and petiole, whitish, with brown bases in some lights, shorter on the front and sides of the head; long, abundant, and oblique on the scapes and legs. Pubescence yellowish, confined to the antennal funiculi.

Brown; fore tibiae and bases of middle and hind tibiae paler; neck, mandibles, except the teeth, cheeks, anterior border of clypeus, antennal funiculus except the basal half of the first joint, whitish yellow; posterior portion of clypeus and antennal insertions somewhat darker; palpi dark brown, with pale articulations.

Described from a single specimen taken on Mt. Matang, W. Sarawak by Prof. Harrison W. Smith.

This species is related to *C. dolichoderoides* Forel but is smaller, shining and with very different pilosity and very differently shaped head and petiole. It is also very different from *C. horrens* Forel of the Philippines and *moeschi* Forel of Sumatra.

173. CAMPONOTUS (MYRMOSPHINCTA) MEGALONYX, sp. nov.

Worker major. Length about 7 mm.

Robust; head large, trapezoidal, broad behind and narrow in front, with straight, anteriorly converging sides and deeply excised posterior border, high and convex in the region of the vertex, with the posterior corners and lateral borders feebly depressed. Eyes on the dorsal surface behind the median transverse diameter of the head, rather small, moderately convex. Mandibles stout and convex, their apical borders long, 6-toothed. Clypeus rather flat, subcarinate behind, the median portion subhexagonal, as long as broad, the lateral portions short, triangular, far from reaching the anterior corners of the head; the anterior border sinuately excised on each side, with a short, narrow, rounded lobe in the middle. Clypeal foveae pronounced. Frontal area large, subtriangular; frontal groove very distinct. Frontal carinae sinuous, diverging behind. Antennae short and stout; scapes feebly curved, narrow, and terete at the base, gradually thickened towards their tips, not reaching the posterior border of the head. Thorax very short; pronotum broad, narrower than the head, convexly rounded, excluding the neck twice as broad as long; mesonotum very short, broader than long, bordered anteriorly by a strong semicircular, promesonotal suture, rapidly sloping in profile to a deep, narrow constriction only as broad as the prominent metanotal stigmata on each side of it. Epinotum subcuboidal, only half as broad as the pronotum, higher than long, with flat sides; in profile with the base abruptly truncated in front, straight and horizontal above and forming a right angle with the flattened, truncated declivity which is narrowed below. Petiole higher than long, subcuboidal, much lower than the epinotum, the node thick, higher than long, the anterior surface slightly concave and higher than the posterior surface, the dorsal surface rounded and sloping backward and downward. Gaster broadly elliptical, smaller than the head, somewhat flattened. Legs stout, the terminal tarsal joint, claws, and empodia noticeably enlarged; tibiae slightly flattened but not chanelled, without a row of bristles on their flexor surfaces.

Opaque; head and gaster slightly lustrous; very finely, densely, and evenly punctate, with sparser piligerous punctures, abundant and transverse on the gaster. Mandibles and legs shining, very finely and superficially shagreened, the mandibles also coarsely and sparsely punctate and near their apical margins coarsely striate; legs with sparse piligerous punctures.

Hairs reddish, rather abundant, erect; long and flexuous on the thoracic dorsum and first gastric segment, shorter elsewhere; absent on the cheeks and almost absent on the antennal scapes, present on the gula and legs. Pubescence long and abundant but nowhere concealing the sculpture, conspicuous on the posterior portion of the head, the thorax and gaster.

Black; thorax and petiole dark brown; upper surface of epinotum and some spots on the pleurae ferruginous; coxae and femora brownish yellow; tibiae, tarsi, and funiculi dark brown; terminal tarsal joints, claws, and empodia reddish.

Worker minor. Length nearly 5 mm.

Very similar to the major worker, except that the head is much smaller, proportionally longer, with straight posterior border, more prominent eyes and the antennal scapes extending about $\frac{1}{6}$ their length beyond the occipital border. The epinotal declivity is slightly concave and a little more sloping, the petiolar node is decidedly thinner. The thorax and legs are dark brown, except the articulations of the latter and the tarsi beyond the basal joint, which are reddish. The erect hairs on the legs are somewhat less numerous.

Described from two major and two minor workers taken by Mr. William Beebe on the Mujong River, Sarawak, "running on bushes."

Like the preceding, this is a very peculiar species, which I have placed in Forel's subgenus Myrmosphincta on account of its thoracic structure. In my opinion this subgenus is an unnatural assemblage of forms, but in the present stage of myrmecology it is useful as a catch-all for the species with markedly sellate thorax. The tarsi and claws of *C. megalonyx* show that it is a true arboreal ant. It exhibits certain peculiarities in the structure of the clypeus and thorax that recall the conditions in Colobopsis.

174. Camponotus (Colobopsis) pilosus (Smith).

Formica pilosa Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 54, ☿.
Colobopsis pubescens Mayr, Verh. Zool. bot. gesellsch. Wien, 1862, **12**, p. 691, ☿ ♀ (*nec* Fabricius).
Camponotus pubescens Emery, Ann. Mus. civ. Genova, 1889, ser. 2, **7**, p. 517.
Camponotus (*Colobopsis*) *leonardi* Emery, ibid., p. 515, ♀.
Camponotus (*Colobopsis*) *pilosus* Forel, Rev. Suisse zool., 1914, **22**, p. 272.

Type-locality: Sarawak, Borneo (A. R. Wallace).

Kapouas Basin (Chaper).

Soldiers, workers, and females from British North Borneo (E. B. Kershaw), Kuching and Rambungan River (H. W. Smith).

175. Camponotus (Colobopsis) badius (Smith).

Formica badia Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 54, ☿.
Camponotus badius Mayr, Verh. Zool. bot. gesellsch. Wien, 1886, **36**, p. 354.
Camponotus (*Colobopsis*) *badius* Forel, Rev. Suisse zool., 1914, **22**, p. 272.

Type-locality: Singapore (A. R. Wallace).
Sarawak (A. R. Wallace).
A worker from Kuching and one from the Rambungan River (H. W. Smith).

176. CAMPONOTUS (COLOBOPSIS) CLERODENDRI Emery.

Colobopsis clerodendri Emery, Ann. Mus. civ. Genova, 1887, ser. 2, **4**, p. 241, ♃ ☿, fig.
Camponotus (*Colobopsis*) *clerodendri* Emery, ibid, 1889, ser. 2, **7**, p. 517; Forel, Rev. Suisse zool., 1914, **22**, p. 272.
Camponotus clerodendri Dalla Torre, Cat. Hymenop., 1893, **7**, p. 225.

Type-locality: Sarawak, Borneo (Doria and Beccari).
Two soldiers and two workers from Kuching (John Hewitt). A note accompanying the specimens states that "this ant vomits a yellow, sticky juice."

177. CAMPONOTUS (COLOBOPSIS) DORIAE Mayr.

Camponotus doriae Mayr, Ann. Mus. civ. Genova, 1872, **2**, p. 137, ☿.
Camponotus (*Colobopsis*) *doriae* Forel, Rev. Suisse zool., 1914, **22**, p. 272.

Type-locality: Sarawak, Borneo (Doria and Beccari).
Two workers from Kuching (John Hewitt).

178. CAMPONOTUS (COLOBOPSIS) FASCIATUS Mayr.

Colobopsis fasciata Mayr, Tijdschr. ent., 1867, **10**, p. 57, ♀.
Camponotus (*Colobopsis*) *fasciatus* Emery, Ann. Mus. civ. Genova, 1889, ser. 2, **7**, p. 517.

Type-locality: Java (Leyden Museum).
Kapouas Basin, Borneo (Chaper).

*179. CAMPONOTUS (COLOBOPSIS) SAUNDERSI Emery.

Camponotus (*Colobopsis*) *saundersi* Emery, Ann. Mus. civ. Genova, 1889, ser. 2, **7**, p. 516, ☿.

Type-locality: Thagatà, Tenasserim (L. Fea).
Six minor workers from the Sarawak River, near Kuching (H. W. Smith).

*180. CAMPONOTUS (COLOBOPSIS) VITREUS (Smith).

Formica vitrea Smith, Journ. Proc. Linn. soc. London. Zool., 1861, **5**, p. 91, ☿.
Camponotus vitreus Emery, in Dalla Torre, Cat. Hymenop., 1893, **7**, p. 257.
Camponotus (*Colobopsis*) *vitreus* Forel, Rev. Suisse zool., 1914, **22**.

Type-locality: Batjan (A. R. Wallace).

A single worker from British North Borneo (E. B. Kershaw).

181. CAMPONOTUS (COLOBOPSIS) STRICTUS (Jerdon).

Formica stricta Jerdon, Madras Journ. lit. sci., 1851, **17**, p. 123, ☿.
Colobopsis stricta Mayr, Verh. Zool. bot. gesellsch. Wien, 1886, **36**, p. 353.
Camponotus strictus Dalla Torre, Cat. Hymenop. 1893, **7**, p. 253.
Camponotus (*Colobopsis*) *strictus* Emery, Ann. Mus. civ. Genova, 1889, ser. 2, **7**, p. 517.

Type-locality: Malabar, Southern India (Jerdon).

Sarawak (A. R. Wallace).

182. CAMPONOTUS (COLOBOPSIS) VIGILANS (Smith).

Formica vigilans Smith, Cat. Hymenop. Brit. mus., 1858, **6**, p. 26, ☿.
Colobopsis vigilans Mayr, Verh. Zool. bot. gesellsch. Wien, 1886, **36**, p. 354.
Camponotus (*Colobopsis*) *vigilans* Emery, Ann. Mus. civ. Genova, 1889, ser. 2, **7**, p. 517.
Camponotus vigilans Dalla Torre, Cat. Hymenop., 1893, **7**, p. 257.

Type-locality: Sarawak, Borneo.

*183. CAMPONOTUS (COLOBOPSIS) LEUCODISCUS, sp. nov.

Female (deälated). Length 5 mm.

Head subrectangular, longer than broad, broader behind than in front, with straight posterior and lateral borders, indistinctly truncate in front and convex dorsally. Eyes large, behind the middle of the head, separated by a distance equal to their length from the anterior corners of the head. Mandibles convex, with 5 subequal teeth. Clypeus flat, ecarinate, subrectangular, a little longer than broad, as broad behind as in front, its lateral borders notched just in front of the middle at the deep, pit-like clypeal foveae, the anterior border rounded and entire. Frontal area lozenge-shaped; frontal groove distinct but not reaching the anterior ocellus. Frontal carinae sinuous, diverging behind. Antennae inserted some distance behind the clypeus; the scapes terete, slightly thickened at their tips, reaching a little beyond the posterior corners of the head; funicular joints all very distinctly longer than broad. Thorax very regularly elongate-elliptical, nearly 2½ times as long as broad, as broad as the head. Mesonotum convex and rounded in front, flattened behind, as long as broad. Epinotum with distinct base and declivity, the former about half as long as the latter, meeting it at a rounded right angle. Petiole low and small, the node very blunt and rounded, about twice as broad as long. Gaster regularly elliptical, a little shorter and broader than the thorax. Legs rather short.

Subopaque; head in front and especially the mandibles more shining; mandibles and clypeus very finely and sparsely punctate; remainder of the body very finely and densely punctate, with coarser, sparse, piligerous punctures, most distinct on the front and posterior portion of the head.

Head, thorax, and gaster with very sparse, delicate, erect, blunt, blackish hairs; antennae and legs with short, sparse, appressed, rather indistinct, pale pubescence.

Black or very dark brown; mandibles, except their teeth, clypeus, cheeks, sides of front, antennae and their insertions, reddish yellow. Gaster milk-white, dorsal surface black, with a large, median, irregularly elliptical white spot, extending from the anterior third of the first to the posterior border of the fourth segment; the posterolateral margins of the second to fourth segments also white; anal segment black, with yellowish tip. Wing-insertions, coxae, and trochanters white; tarsi, anterior surface of the fore legs and ventral portions of the fore femora brownish yellow.

Described from a single specimen taken by Mr. E. B. Kershaw in British North Borneo.

This species is readily distinguished by its unusual coloration from any of the Colobopsis of which I have seen specimens or descriptions. Its small size indicates that the workers must be diminutive, like those of the European and North American species.[1]

184. Camponotus (Colobopsis) gilviceps Roger.

Formica ruficeps Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 54, ☿ (*nec* Fabricius).

Camponotus gilviceps Roger, Verzeichn. formicid., 1863, p. 3; Forel, Ann. Soc. ent. Belgique, 1909, **53**, p. 57 *nota*.

---

[1] Since the foregoing description was written I have received from Dr. J. W. Chapman a fine series of the soldiers and workers of this ant taken at Dumaguete, Negros Oriental, in The Philippines. The soldiers are colored like the female, but in the worker the white gastric spot is shorter, extending only to or slightly beyond the posterior margin of the second segment.

Camponotus (Colobopsis) gilviceps Forel, Rev. Suisse zool., 1914, **22**, p. 272.

Type-locality: Sarawak, Borneo (A. R. Wallace).

185. CAMPONOTUS (COLOBOPSIS) HOSEI Forel.

Camponotus hosei Forel, Rev. Suisse zool., 1911, **19**, p. 55, ☿.
Camponotus (Colobopsis) hosei Forel, ibid., 1914, **22**, p. 272.

Type-locality: Borneo (Hose).

186. CAMPONOTUS (COLOBOPSIS) HOSEI var. MIMUS Forel.

Camponotus hosei var. *mimus* Forel, Rev. Suisse zool., 1911, **19**, p. 56, ♀.

Type-locality: Borneo (Hose).

187. CAMPONOTUS (COLOBOPSIS) SEVERINI Forel.

Camponotus (Colobopsis) severini Forel, Ann. Soc. ent. Belgique, 1909, **53**, p. 55, ♃ ☿ ♀ ♂.

Type-locality: Labuan Island, Borneo.

188. CAMPONOTUS (COLOBOPSIS) SMITHIANUS, sp. nov.

Worker major. Length 5–5.6 mm.

Head large, regularly oblong, 1½ times as long as broad, equally flattened above and below, obliquely truncated in the clypeal region, with the cheeks swollen and rounded and their borders projecting anteriorly around the insertions of the mandibles as curved plates; the region in front of the eyes and near the frontal carinae distinctly impressed on each side; the eyes rather small and flat, their anterior orbits just in front of the posterior third of the head. Mandibles very stout and convex, with five obtuse teeth. Palpi very short. Clypeus with distinct median and lateral portions, the former ecarinate, consisting of two planes, a posterior continuing the dorsal surface of the head, rectangular and nearly twice as broad as long, and an anterior, obliquely sloping and semicircular, its median curved edge forming the anterior border of the clypeus. The triangular, scale-like lateral portions of the clypeus are marked off by grooves that terminate behind in the small but distinct clypeal foveae. Frontal area indistinct; frontal groove delicate; frontal carinae long, lyriform, continued nearly as far back as the posterior orbits, diverging behind where they are twice as far apart as their distance from the lateral corners of the head. Antennae short and slender, the scapes uniformly bent, slightly flattened though narrow at the base, gradually enlarging towards their tips, which reach the posterior corners of the head; funiculi of very uniform thickness throughout, the joints subequal, a little longer than broad, the first and last longer. Thorax much narrower and a little shorter than the head, the pro- and mesonotum together forming a hemispherical mass, with strong mesoëpinotal suture, the mesonotum broader than long. Mesoëpinotal constriction rather deep and very short; metanotal sclerite distinct, short, and convex; epinotum very small, its base long, flattened, nearly perpendicular, the declivity extremely short and strongly concave. Petiole thick, and very low; from above twice as broad as long and a little narrower in front than behind, in profile truncated anteriorly, posteriorly, and dorsally, the posterior surface higher than the anterior and distinctly impressed in the middle above. Gaster elongate-elliptical, smaller than the head. Legs rather stout, slightly flattened, the fore femora enlarged, the claws well developed.

Mandibles shining, finely and evenly but not densely punctate; anterior half of head subopaque, densely and finely punctate and minutely and indistinctly rugulose; remainder of body shining, distinctly shagreened, the gaster transversely, covered with sparse, piligerous punctures.

Hairs grayish, coarse, erect, of uneven length, longest and moderately abundant on the dorsal surface of the head, thorax, petiole, and gaster; absent on the gula; short, even, and oblique on the legs and distal portions of the antennal scapes. Pubescence pale, long, coarse, and sparse, conspicuous on the sides of the head, between the frontal carinae and on the gaster.

Black; mandibles, cheeks, and clypeus cherry-red; antennal funiculi yellow, except the first and last joint, which are black or piceous like the scapes; tarsi and articulations of the thorax, petiole, and legs brown or reddish.

Worker minor. Length 3.5 mm.

Head subtrapezoidal, as broad as long, a little narrower in front than behind, with feebly convex sides and posterior border, only moderately and evenly convex above, with the eyes at the posterior third. Mandibles narrow, with oblique, apparently 4-toothed apical and straight lateral borders. Maxillary palpi much longer than in the major worker. Clypeus broader than long, subtrapezoidal, feebly carinate, with nearly straight, entire anterior border. Frontal area obsolete; frontal groove feeble; frontal carinae short, rather straight, strongly diverging behind. Antennae long, the scapes extending about $\frac{1}{3}$ their length beyond the posterior corners of the head; first funicular joint nearly as long as the second and third together, the second distinctly shorter than the third, which like the fourth and fifth is nearly twice as long as broad. Thorax in profile composed of two subequal hemispherical masses, one formed by the pro- and mesonotum, the other by the meta- and epinotum, meeting at a short, acute, mesoëpinotal incision; the epinotum really without distinct base and declivity, though the lower metasternal border is reflected at the articulation with the petiole. Petiole resembling that of the major worker, but even lower, with its dorsal surface more truncated and flattened.

Sculpture and pilosity much as in the worker major, but the anterior portion of the head not subopaque and punctate, the pubescence on the sides and front of the head replaced by oblique or subappressed, rather abundant hairs and the scapes as abundantly provided with oblique hairs as the legs.

Black; mandibles, anterior border of cheeks and clypeus, the mesopleurae, sides and posteroinferior border of the epinotum, and the tarsi beyond the first joint, red. Funicular joints 3–9 brownish yellow.

Described from three major workers and one minor worker taken on the Rambungan River, Sarawak by Prof. Harrison W. Smith, to whom the species is dedicated. It is very distinct from all the Indomalayan Colobopsis of which I have seen specimens or descriptions. *Type.* M. C. Z. 9,074.

189. Camponotus (incertae sedis) tenuipes (Smith).

Formica tenuipes Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 57, ♀.

Camponotus tenuipes Mayr, Verh. Zool. bot. gesellsch. Wien, 1886, **36**, p. 351.

Type-locality: Sarawak, Borneo (A. R. Wallace).

190. Polyrhachis (Polyrhachis) bihamata (Drury).

Formica bihamata Drury, Illustr. nat. hist., 1773, **2**, pl. 38, fig. 7, 8, ☿.

Formica affinis Le Guillou, Ann. Soc. ent. France, 1841, **10**, p. 314, ♀.

Polyrhachis bihamata Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 58, pl. 1, fig. 9.

Polyrhachis affinis Mayr, Verh. Zool. bot. gesellsch. Wien, 1863, **13**, p. 443.

Type-locality: Johanna Island, Comoro Islands.

Sarawak, (Doria and Beccari; A. R. Wallace); Kapouas Basin (Chaper).

Numerous workers from Sarawak River, Kuching, Serambu, Sarawak (H. W. Smith) and Kuching (John Hewitt).

191. Polyrhachis (Polyrhachis) bellicosa Smith.

Polyrhachis bellicosus Smith, Journ. Proc. Linn. soc. London. Zool., 1859, **3**, p. 142, ☿.

Polyrhachis bihamata var. *bellicosa* Mayr, Verh. Zool. bot. gesellsch. Wien, 1862, **12**, p. 677.
Polyrhachis bellicosa Mayr, Tijdschr. ent. 1867, **10**, p. 50, ☿.

Type-locality: Aru (A. R. Wallace).
Sarawak (Doria and Beccari; Bedot and Pictet).

Numerous workers from Sadong, Serambu, and Sarawak River, Kuching (H. W. Smith), British North Borneo (E. B. Kershaw), and Kuching (John Hewitt).

192. POLYRHACHIS (POLYRHACHIS) YPSILON Emery.

Polyrhachis bihamata Smith, Cat. Hymenop. Brit. mus., 1858, **6**, p. 58, ☿.
Polyrhachis ypsilon Emery, Ann. Mus. civ. Genova, 1887, ser. 2, **4**, p. 239, ☿.

Type-locality: Borneo.
Fourteen workers from Sadong and Kuching (H. W. Smith).

193. POLYRHACHIS (CAMPOMYRMA) EQUINA Smith.

Polyrhachis equinus Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 63, ☿.
Polyrhachis equina Dalla Torre, Cat. Hymenop., 1893, **7**, p. 261.
Polyrhachis biloba Forel, Rev. Suisse zool., 1911, **19**, p. 58, ☿.

Type-locality: Sarawak, Borneo (A. R. Wallace).
Sarawak (Haviland).

Examination of a single specimen taken by John Hewitt at Kuching shows that Forel has redescribed Smith's *Polyrhachis equina* as *biloba.*

194. POLYRHACHIS (CAMPOMYRMA) GRIBODOI Emery.

Polyrhachis gribodoi Emery, Ann. Mus. civ. Genova, 1887, ser. 2, **4**, p. 22, ☿ ♀.

Type-locality: Java.
Sarawak (Doria and Beccari).

195. POLYRHACHIS (MYRMA) RELUCENS (Latreille).

Formica relucens Latreille, Hist. nat. fourmis., 1802, p. 131, ☿, pl. 4, fig. 24.
Polyrhachis relucens Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 59.

Type-locality: East Indies (Riche and La Billardière).
Sarawak (A. R. Wallace).

196. POLYRHACHIS (MYRMA) PRUINOSA Mayr.

Polyrhachis pruinosa Mayr, Ann. Mus. civ. Genova, 1872, **2**, p. 142, ☿.

Type-locality: Sarawak, Borneo (Doria and Beccari).

197. POLYRHACHIS (MYRMA) MURINA Emery.

Polyrhachis murina Emery, Rev. Suisse zool., 1893, **1**, p. 198, ☿.

Type-locality: Sarawak, Borneo (Bedot and Pictet).

198. POLYRHACHIS (MYRMA) MAYRI Roger.

Polyrhachis relucens Mayr, Verh. Zool. bot. gesellsch. Wien, 1862, **12**, p. 685, ☿ (*nec* Latreille).
Polyrhachis mayri Roger, Verzeich. formicid., 1863, p. 7; Mayr, Tijdschr. ent. 1867, **10**, p. 56, ☿.

Type-locality: Java (Kirsch).
Sarawak (Doria and Beccari); Kapouas Basin (Chaper).
Two workers from Serambu Mt., Sarawak (H. W. Smith).

199. POLYRHACHIS (MYRMA) LYCIDAS Smith.

Polyrhachis lycidas Smith, Journ. Proc. Linn. soc. London. Zool., 1861, **6**, p. 43, ☿, pl. 1, fig. 23; Mayr, Tijdschr. ent., 1867, **10**, p. 31, ☿ ♀.

Type-locality: Celebes.
Borneo (Leyden Mus.).
Two workers from Kuching (John Hewitt).

200. POLYRHACHIS (MYRMA) BECCARII Mayr.

Polyrhachis beccarii Mayr, Ann. Mus. civ. Genova, 1872, **2**, p. 141, ☿; Emery, ibid., 1887, ser. 2, **4**, p. 232, ☿.

Type-locality: Sarawak, Borneo (Doria and Beccari).
Two workers from Kuching (John Hewitt).

201. POLYRHACHIS (MYRMA) NIGROPILOSA Mayr.

Polyrhachis nigropilosa Mayr, Ann. Mus. civ. Genova, 1872, **2**, p. 141, ☿; Emery, ibid, 1887, ser. 2, **4**, p. 232, ☿.

Type-locality: Sarawak, Borneo (Doria and Beccari).

Three workers from Serambu Mt., Sarawak and Kuching (H. W. Smith) and British North Borneo (E. B. Kershaw).

201a. POLYRHACHIS (MYRMA) NIGROPILOSA var. CONOPHTHALMA Emery.

Polyrhachis nigropilosa var. *conophthalma* Emery, Ann. Mus. civ. Genova, 1900, ser. 2, **20**, p. 713, ☿.

Type-locality: Sumatra (E. Modigliani).

A single worker from Serambu Mt., Sarawak (H. W. Smith).

202. POLYRHACHIS (MYRMA) SCULPTURATA Smith.

Polyrhachis sculpturatus Smith, Journ. Proc. Linn. soc. London. Zool., 1861, **5**, p. 70, ☿ ♀.

Polyrhachis sculpturata Mayr, Tijdschr. ent., 1867, **10**, p. 59, ☿.

Type-locality: Makassar, Celebes (A. R. Wallace).

Kapouas Basin, Borneo (Chaper).

203. POLYRHACHIS (MYRMA) STRIATA Mayr.

Polyrhachis striatus Mayr, Verh. Zool. bot. gesellsch. Wien, 1862, **12**, p. 686, ☿, pl. 19, fig. 8.

Polyrhachis striata Mayr, Reise Novara. Zool., **2**, Formicid., 1865, p. 44, ☿, pl. 2, fig. 11.

Type-locality: Java (Novara Expedition).

Sarawak (Doria and Beccari).

A single worker from Kuching (John Hewitt).

204. POLYRHACHIS (MYRMA) SUMATRENSIS Smith.

Polyrhachis sumatrensis Smith, Cat. Hymenop. Brit. mus., 1858, **6**, p. 65, ♀, pl. 4, fig. 43; Forel, Sitzb. K. bayr. akad. wiss. Math. phys. klasse, 1911, p. 296.

Type-locality: Sumatra.
Sarawak (Munich Mus.).

205. POLYRHACHIS (MYRMA) VILLIPES Smith.

Polyrhachis villipes Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 61, ☿; Mayr, Tijdschr. ent., 1867, **10**, p. 58, ☿.

Type-locality: Sarawak, Borneo (A. R. Wallace).
Sarawak (Doria and Beccari; Haviland).

Two workers and a female from Kuching (John Hewitt) and a worker from the same locality (H. W. Smith).

206. POLYRHACHIS (MYRMA) VINDEX Smith.

Polyrhachis vindex Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 64, ☿.

Type-locality: Sarawak, Borneo (A. R. Wallace).
Worker. Length: 5–6 mm.

Head broadly oval, a little longer than broad, and a little broader behind than in front, nearly as high in the region of the frontal carinae as long. Eyes distinctly behind the middle of the sides, moderately large and convex. Mandibles with feebly convex external and oblique, coarsely 4-toothed apical border. Clypeus subcarinate, its anterior border feebly and sinuately emarginate in the middle and on each side. Frontal area distinct, triangular; frontal carinae closely approximated, erect, very close together anteriorly. Antennae long; scapes slender, reaching about $\frac{2}{5}$ their length beyond the occiput. Thorax short, only a little longer than its greatest height, the sides flat, the dorsum evenly convex and rounded, its sides acutely marginate, the margin incised at the distinct promesonotal and at the nearly obsolete mesoëpinotal suture. Pronotum, excluding the neck, nearly twice as broad as long, its anterior corners produced as flattened, acute spines which are nearly twice as long as broad at their bases, and directed forward and very slightly outward. Mesonotum transversely oblong, nearly as broad as the pronotum and nearly four times as broad as long. Base of epinotum trapezoidal, somewhat less than twice as broad as long, with straight sides and posterior border, the latter strongly marginate, with a small, acute, upturned tooth at each corner, the declivity abrupt, concave and narrowed below, as long as the base and marginate on the sides. Petiole lenticular, as broad as the anterior border of the epinotum, in profile convex anteriorly and posteriorly, with a sharp superior border, which seen from behind is evenly arcuate and entire, with a small, rather acute, triangular tooth on each side. Below the teeth the sides are straight and rapidly converge. Gaster subglobose, with very large first segment, strongly and concavely truncated in front. Legs long and stout, tibiae cylindrical, constricted at the base, without bristles on their flexor surfaces.

Subopaque; mandibles finely and evenly striated, with minute, scattered punctures; clypeus finely and densely punctate; upper surface of head, dorsum and sides of thorax evenly and rather finely longitudinally rugose with indistinctly punctate interrugal spaces; sides of head finely and somewhat irregularly rugulose-punctate; gula smooth and shining; declivity of epinotum finely, transversely rugulose; petiole and gaster lustrous, very finely and indistinctly punctate.

Hairs very sparse, whitish, erect, confined to the head and tips of the gaster. Pubescence whitish, indistinct on the head; longer and more abundant on the pleurae; very fine and dense, producing a pruinose appearance on the thoracic dorsum, petiole, and gaster, less apparent on the legs.

Black; palpi reddish; legs variable in color; in some specimens black throughout, in others with the femora and tibiae red or reddish yellow and the knees, coxae, and tarsi black.

Eight workers; three from Kuching (John Hewitt "nesting at base of an epiphyte between intertwining roots"), one from Kuching and one from Serambu Mt. (H. W. Smith), two from Bongo Mt. (Hewitt and Brooks) and one from Mt. Matang, West Sarawak (G. E. Bryant).

I have redescribed this form in detail because it seems certain that it is Smith's *P. vindex*, which has not been recognized up to the present time. The species is evidently very close to Smith's *inermis* and *orsyllus*, especially to the latter, but both of these forms were described later and would therefore be only subspecies or synonyms of *vindex*.

*207a. POLYRHACHIS (HEMIOPTICA) ACULEATA Mayr subsp. CYBELE, subsp. nov.

Worker. Length 6–6.5 mm.

Differing from the typical form in its somewhat larger size, broader head, and decidedly larger and higher petiole, with its two spines a little shorter and the transverse margin between them more arcuate and sharper. The eyes are a little larger and distinctly less truncated laterally and less conical and more hemispherical when seen from the front. The erect, pale hairs on the body are distinctly less abundant than in the typical *aculeata* and the legs are entirely black.

Described from four specimens from Kuching (John Hewitt). *Type.*—M. C. Z. 9,076.

*208a. Polyrhachis (Myrmothrinax) thrinax Roger var. javanica Mayr.

Polyrhachis thrinax var. *javanica* Mayr, Tijdschr. ent., 1867, **10**, p. 20, ☿.

Type-locality: Java (Mus. Holm.).

Three workers from Kuching (John Hewitt).

209. Polyrhachis (Myrmothrinax) aequicuspis, nom. nov.

Polyrhachis constructor Smith, Cat. Hymenop. Brit. mus., 1858, **6**, p. 68, ♀, pl. 4, fig. 23 (*nec P. constructor* Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 60).

Type-locality: Sarawak, Borneo (Saunders Coll.).

It seems not to have been noticed that Smith gave the name *constructor* to two very different species of Polyrhachis. In 1857 he described a *P. constructor* from a female specimen taken by A. R. Wallace at Sarawak. This specimen measured 3½ lines and had the petiole "quadrate, with two very stout, short, curved spines above" and the body covered with "short, silky, ashy pile, most apparent on the abdomen." In 1858 he gave the same name to a female from the same locality but from the W. W. Saunders Collection, measuring 4½ lines, with the "node of the petiole incrassate and with three stout, short, acute spines." The figure accompanying this description shows that he had before him a species of Myrmothrinax, with subequal petiolar spines, possibly the form afterwards called *thrinax* var. *javanica* by Mayr. It therefore becomes necessary to change the name of the second *constructor*. The first will have to be consigned to the species of Polyrhachis *incertae sedis* for the present (*vide infra* p. 137).

*210. Polyrhachis (Myrmothrinax) triaena, sp. nov.

Worker. Length 6.5–7 mm.

Head a little longer than broad, a little broader behind than in front, with evenly rounded and convex occipital border and straight sides; very convex dorsally in the frontal region. Eyes large and convex, broadly elliptical, their anterior orbits at the median transverse diameter of the head. Mandibles very convex, with five large, subequal teeth. Clypeus carinate, broader than long, its anterior border entire, evenly rounded and slightly projecting. Frontal area distinct, triangular; frontal groove narrow but distinct; frontal carinae rather approximated, prominent, sinuous, as near together behind as in front. Antennae long; scapes extending more than half their length beyond the occipital border, the basal funicular joints about 2¼ times as long as broad. Thorax slender, its dorsal and lateral surfaces flattened, the former strongly marginate on all sides, except at the neck. Promesonotal and meso-ëpinotal sutures distinct, but not incised where they meet the lateral marginations. Dorsum of pronotum as broad as long, with two flat, blunt teeth anteriorly, as long as broad at their bases, directed outwards; dorsum of mesonotum trapezoidal, about 1¼ times as long as broad, with straight sides, converging posteriorly. Base of epinotum regularly oblong, twice as long as broad, its posterior angles forming two small erect teeth, as large as those on the pronotum but more acute; epinotal declivity shorter than the base, sloping and concave. Petiole from above 1¼ times as long as broad, broader in front than behind, bearing above in the middle a long, straight, backwardly directed spine, nearly as long as the greatest height of the remainder of the petiole, and on each side a triangular tooth, only a little longer than broad at the base and somewhat blunter than the median spine. Gaster a little larger than the head, oval, broad in front. Legs long; tibiae cylindrical, distinctly constricted at the base, without a row of bristles on their flexor surfaces.

Mandibles slightly shining, very finely striated and finely and sparsely punctate; clypeus, head, thorax, and petiole densely and evenly punctate. Gaster and legs very finely and superficially shagreened, the former shining, the latter lustrous.

Hairs very few, short, obtuse, yellowish, confined to the clypeus, mandibles, and tip of the gaster; pubescence extremely fine and dilute, visible only on the antennae and tibiae.

Brownish ferruginous; scapes, legs, and gaster a little paler than the head, thorax, and petiole.

Female (deälated). Length nearly 10 mm.

Resembling the worker in the shape of the head and petiole. Thorax elongate-elliptical, nearly 2½ times as long as broad, narrower than the head; meso- and epinotum not marginate on the sides, the former as broad as long, convex in front, flattened behind; the latter with subequal base and declivity, the base slightly convex and not separated from the sloping, concave declivity by a transverse ridge as in the worker; epinotal teeth stout, short, and blunt, directed upward. Pronotum with the blunt, triangular teeth at the anterior corners not connected by a distinct transverse carina. Median spine of the petiole of rather uniform thickness, with blunt tip.

Sculpture resembling that of the worker, but the head, thorax, and petiole delicately reticulate-rugose as well as finely punctate.

Black; tip of last funicular joint yellowish; gaster with a slightly reddish tint.

Described from two workers and a female taken by Mr. John Hewitt at Kuching.

Of the various species of Myrmothrinax, namely *thrinax* Roger, *textor* Smith, *aequicuspis* Wheeler, *dahli* Forel and *frauenfeldi* Mayr, this species seems to be most closely related to the last. The worker *triaena*, however, is smaller, not black and has the sides of the thorax sharply marginate, whereas Mayr says of *frauenfeldi* that it has the "thorax sine marginibus acutis." The Bornean form is not unlike *dahli* in the general shape of the thorax, but the pronotal teeth of the former are longer, the epinotal teeth much shorter, the sculpture, color, and size are different and the basal funicular joints are shorter. *P. triaena* occurs also in Java as I possess a deälated female from that island received from Staudinger under the name *frauenfeldi*.

211. POLYRHACHIS (CHARIOMYRMA) ARCUATA (Le Guillou).

Formica arcuata Le Guillou, Ann. Soc. ent. France, 1841, **10**, p. 315, ☿ ♀.
Polyrhachis latifrons Roger, Berlin ent. zeitschr. 1863, **7**, p. 155, ☿.
Polyrhachis modiglianii Emery, Ann. Mus. civ. Genova, 1888, ser. 2, **5**, p. 529, ☿ ♀, pl. 9, fig. 1.
Polyrhachis arcuata Forel, Mitth. Zool. mus. Berlin, 1901, **2**, p. 32.

Type-locality: Borneo (Voyage of the "Astrolabe" and "Zelée").

A single deälated female from Bongo Mt., Sarawak (Hewitt and Brooks).

212. POLYRHACHIS (MYRMHOPLA) ARMATA (Le Guillou).

Formica armata Le Guillou, Ann. Soc. ent. France, 1841, **10**, p. 313, ♂.
Polyrhachis armata Mayr, Tijdschr. ent., 1867, **10**, p. 46, ☿.
Polyrhachis defensus Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 59, ☿.
Polyrhachis pandarus Smith, ibid, p. 62, ☿.

Type-locality: Samboangan, Philippines (Voyage of the "Astrolabe" and "Zelée").

Sarawak (Doria and Beccari; A. R. Wallace); Hayvep (Winkler).

Numerous workers and females from Kuching (John Hewitt) and Kuching, Matang, and Serambu Mts. (H. W. Smith) and British North Borneo (E. B. Kershaw). Nearly all of these specimens have the gaster ferruginous instead of black.

213. Polyrhachis (Myrmhopla) lugens Mayr.

Polyrhachis lugens Mayr, Tijdschr. ent., 1867, **10**, p. 31, ♀.

Type-locality: Borneo (Leyden Museum).

*214. Polyrhachis (Myrmhopla) pressa Mayr.

Polyrhachis pressus Mayr, Verh. Zool. bot. gesellsch. Wien, 1862, **12**, p. 681, ☿ ♀.
Polyrhachis pressa Mayr, Reise Novara. Zool., **2**. Formicid., 1865, p. 39, ☿ ♀, pl. 1, fig. 5.

Type-locality: Batavia, Java (Novara Expedition).
A single worker from Kuching (John Hewitt).

215. Polyrhachis (Myrmhopla) abdominalis Smith.

Polyrhachis abdominalis Smith, Cat. Hymenop. Brit. mus., 1858, **6**, p. 63, ☿.
Polyrhachis phyllophilus Smith, Journ. Proc. Linn. soc. London. Zool. Suppl., 1860, **4**, p. 69, ☿.
Polyrhachis phyllophila Mayr, Tijdschr. ent., 1867, **10**, p. 47, ☿.

Type-locality: Burmah.
Sarawak (Doria and Beccari); Kapouas Basin (Chaper).
Two workers from British North Borneo (E. B. Kershaw) and one from Serambu Mt., Sarawak (H. W. Smith).

216. Polyrhachis (Myrmhopla) rubiginosa (Le Guillou).

Formica rubiginosa Le Guillou, Ann. Soc. ent. France, 1841, **10**, p. 316, ☿.
Polyrhachis rubiginosa Emery in Dalla Torre, Cat. Hymenop., 1893, **7**, p. 268.

Type-locality: Borneo (Voyage of the "Astrolabe" and "Zelée").

*217. Polyrhachis (Myrmhopla) rugifrons Smith.

Polyrhachis rugifrons Smith, Journ. Proc. Linn. soc. London. Zool., 1861, **5**, p. 70, ♀; Mayr, Tijdschr. ent., 1867, **10**, p: 43, ☿.

Type-locality: Makassar, Celebes (A. R. Wallace).
A single worker from Serambu Mt., Sarawak (H. W. Smith).

*218. Polyrhachis (Myrmhopla) furcata Smith.

Polyrhachis furcatus Smith, Cat. Hymenop. Brit. mus. 1858, **6**, p. 64, ☿, pl. 4, fig. 20.
Polyrhachis furcata Forel, Journ. Asiat. soc. Bengal, 1886, **55**, p. 241, ☿; Emery, Ann. Mus. civ. Genova, 1889, ser. **2**, **7**, p. 518, ☿ ♀.

Type-locality: Burmah.

A single deälated female from the Rambungan River, Sarawak (H. W. Smith). As Emery has observed, the petiolar spines of the female are not hooked as in the worker, but merely curved.

219. Polyrhachis (Myrmhopla) chalybea Smith.

Polyrhachis chalybea Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 61, ☿.

Type-locality: Singapore (A. R. Wallace).

Sarawak (Doria and Beccari); Kapouas Basin (Chaper).

A single worker from Kuching (John Hewitt).

220. Polyrhachis (Myrmhopla) argentea Mayr.

Polyrhachis argenteus Mayr, Verh. Zool. bot. gesellsch. Wien, 1862, **12**, p. 682, ☿.
Polyrhachis argentea Mayr, Reise Novara. Zool., **2**. Formicid., 1865, p. 40, ☿, pl. 2, fig. 7.
Polyrhachis acasta Forel, Journ. Asiat. soc. Bengal, 1886, **55**, p. 241, ☿; Dalla Torre, Cat. Hymenop., 1893, **7**, p. 257.

Type-locality: Manila, Philippine Islands (Novara Expedition).

Sarawak (Bedot and Pictet).

221. Polyrhachis (Myrmhopla) bicolor Smith.

Polyrhachis bicolor Smith, Cat. Hymenop. Brit. mus. 1858, **6**, p. 65, ♀; Mayr, Verh. Zool. bot. gesellsch. Wien, 1862, **12**, p. 681, ♀, pl. 19, fig. 5.

Type-locality: Burmah.

Sarawak (Doria and Beccari; Bedot and Pictet). Tandjong, S. E. Borneo (Fritz Suck).

A few workers, females, and males from Kuching (John Hewitt).

221a. POLYRHACHIS (MYRMHOPLA) BICOLOR Smith var. AURINASIS Forel.

Polyrhachis bicolor var. *aurinasis* Forel, Mitth. Naturh. mus. Hamburg, 1901, **18**, p. 77, ☿.

Type-locality: Sarawak, Borneo (Haviland).

222. POLYRHACHIS (MYRMHOPLA) CEPHALOTES Emery.

Polyrhachis cephalotes Emery, Rev. Suisse zool., 1893, **1**, p. 199, ☿, pl. 8, fig. 6; Forel, Rev. Suisse zool., 1913, **21**, p. 665, ☿ ♀ ♂.

Type-locality: Deli, Sumatra (Bedot and Pictet).
Balik Papan, Borneo (Kampmeinert).

223. POLYRHACHIS (MYRMHOPLA) DIVES Smith.

Polyrhachis dives Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 64, ☿.
Polyrhachis acantha Smith, ibid, Suppl., 1860, **4**, p. 98, ☿, pl. 1, fig. 16.

Type-locality: Singapore (A. R. Wallace).
Borneo (Leyden Museum).

*224. POLYRHACHIS (MYRMHOPLA) TIBIALIS Smith.

Polyrhachis tibialis Smith, Cat. Hymenop. Brit. mus., 1858, **6**, p. 63, ☿.

Type-locality: Burmah.
A single worker from Kuching (John Hewitt).

225. POLYRHACHIS (MYRMHOPLA) DIOTIMA Forel.

Polyrhachis diotima Forel, Rev. Suisse zool., 1911, **19**, p. 60, ☿.

Type-locality: Hayvep, Borneo (Winkler).

226. POLYRHACHIS (MYRMHOPLA) ASPASIA Forel.

Polyrhachis aspasia Forel, Rev. Suisse zool., 1911, **19**, p. 59, ☿.

Type-locality: Sarawak, Borneo (Haviland).

*227. POLYRHACHIS (MYRMHOPLA) DAPHNE, sp. nov.

Worker. Length: 5.5-6 mm.

Head a little longer than broad, a little broader at the eyes than at the anterior corners, semicircularly rounded behind, with rather straight sides and cheeks; in profile very convex in the region of the frontal carinae, with feebly convex gular surface. Eyes large and convex, their anterior orbits at the median transverse diameter of the head. Palpi long and slender. Mandibles moderately convex, with four stout, subequal teeth. Clypeus semicircular, convex, ecarinate; its anterior border very feebly sinuate on each side of the middle which does not project as a lobe. Clypeal fossa very pronounced. Frontal area indistinct, triangular. Frontal carinae approximated, sinuate, erect, not further apart behind than in front. Antennae long, their scapes extending fully half their length beyond the occipital border of the head. Thorax subcylindrical, narrower than the head, a little broader through the posterior part of the pronotum than through the meso- and epinotum which are of equal width; pro- and mesoëpinotal sutures very distinct and strongly impressed. Pronotum, excluding the neck, a little broader than long, rounded on the sides, with two stout, straight, acute spines which are twice as long as the width of their bases and directed forward and outward. Mesonotum as long as broad, its anterior outline semicircular, its lateral and posterior borders straight, the sides not marginate. Epinotum compressed above, the base horizontal and slightly concave, oblong, strongly marginate on the sides, the marginations continued into the spines which are stout, straight, acute, twice as long as those on the pronotum and as long as the base of the epinotum, laterally compressed, and directed backward and very slightly upward. The epinotal declivity is abrupt, slightly concave in profile, not marginate on the sides, with large, prominent stigmata. Petiole subcuboidal with a denticle on each side below near the anterior border and above with two stout, compressed, curved spines, a little longer than those on the epinotum and directed outward and backward. The distance between their tips is less than half the diameter of the first gastric segment. Gaster large, broadly elliptical, less than half of it formed by the first segment, slightly flattened dorsoventrally, convex but not truncated in front. Legs long; tibiae cylindrical, slightly constricted at the base, without bristles on their flexor surfaces.

Mandibles and clypeus smooth and shining, the former minutely and sparsely punctate; head shining above, subopaque on the sides; shagreened, the vertex and sides of the front sparsely punctate. Thorax and petiole opaque; sides of the former densely and evenly punctate, the dorsum very finely punctate-rugulose, the rugules on the mesonotum obscurely concentric, the base of the epinotum, especially behind, smooth and shining. Petiole indistinctly punctate, slightly shining between the insertions of the spines. Gaster shining, very finely and superficially shagreened or aciculate, with small, sparse punctures; legs more opaque and more coarsely shagreened.

Hairs yellow, erect; present only on the venter, tip of gaster, mandibles, and anterior border of the clypeus. Pubescence yellow, very short, sparse, and appressed, distinct on the sides of the head, on the legs and gaster.

Brownish yellow; mandibles reddish, with dark brown teeth; scapes, except their tips, a median line on the clypeus, the upper surface of the head and sides of the front, a large spot on the pronotum, the mesonotum, epinotum, petiole, and basal half of first gastric segment, brown; epinotal and petiolar spines, tarsi, and constricted bases of the tibiae somewhat darker.

Described from two specimens taken by Prof. Harrison W. Smith on Matang Mt., near Kuching. *Type.*—M. C. Z. 9,075.

I can find no description of this beautiful and striking species.

*228. POLYRHACHIS (MYRMHOPLA) PERSONATA, sp. nov.

Worker. Length nearly 5 mm.

Head oval, a little longer than broad, slightly narrowed in front and behind, with rounded sides, convex above in the region of the frontal carinae, the lower surface in profile convex in the middle, owing to a peculiar condition of the occipital margin, which descends on each side of the narrowed gula as a prominent ridge or fold and extends all the way to the anterior corner of the head, with a blunt angle about half way between the neck and the mandible. The ant therefore has the appearance of wearing a mask, the border of which stands off on the sides and below from the neck. Eyes moderately large and convex, broadly elliptical, with impressed orbits, at the middle of the sides of the head. Mandibles feebly convex, 5-toothed. Clypeus moderately convex, subcarinate behind, its border forming a short lobe, straight in the middle and rounded on each side. Frontal area obsolete. Frontal carinae approximated, strongly sinuate and bluntly angular in the middle, a little further apart behind than in front. Antennae long, the scapes extending about $\frac{1}{5}$ their length beyond the occipital border. Thorax subcylindrical, narrower than the head, about twice as long as broad, slightly broader through the pronotum than elsewhere; pronotum, excluding the neck, as long as broad, rounded and rather convex above, anteriorly with a pair of straight, slender, acute spines, directed outward, upward, and slightly forward. Promesonotal suture distinct and slightly impressed; mesoëpinotal suture obsolete. Mesonotum broader than long, transversely rounded, its dorsal outline straight in profile. Epinotum short, the base much shorter than the straight, abrupt declivity, armed with two slender, acute spines about half again as long as those of the pronotum, directed outward, backward, and upward, their tips very feebly recurved. Petiole stout, with convex anterior and posterior surfaces, bearing above a pair of long, stout, curved, acute spines. These are much longer and stouter than those on the epinotum and form a semicircle, clasping the base of the gaster. The median dorsal border of the petiole between their bases bears two small acute teeth. Gaster subglobose, as broad as long, slightly flattened, the first segment forming about ⅗ of its surface, truncated in front. Legs moderately long; tibiae cylindrical, constricted at the base, without bristles on their flexor surfaces.

Gaster and gula smooth and shining; remainder of body and the appendages subopaque. Mandibles very finely striated and sparsely punctate; head, thorax, and petiole densely punctate-rugulose, the rugules coarser and reticulate on the dorsal surface of the head; the spines of the epinotum and petiole very finely shagreened, like the antennal scapes and legs.

Hairs whitish, erect; present only on the venter, tip of gaster, clypeal border, and mandibles. Pubescence pale, very fine and dilute, visible only on the tibiae, antennal funiculi, and sides of the gaster.

Black; palpi and spurs of the tibiae red.

Described from a single specimen taken by Mr. G. E. Bryant on Mt. Matang, West Sarawak and sent me by Mr. Horace Donisthorpe.

This species belongs to the *dives* group but is very distinct in the shape of the head, thorax, and petiole.

*229. POLYRHACHIS (MYRMHOPLA) ATROVIRENS Emery.

Polyrhachis atrovirens Emery, Ann. Mus. civ. Genova, 1900, ser. 2, **20**, p. 718, ☿, fig. 16a.

Type-locality: Bua Bua, Engana (E. Modigliani).

A single worker from Sadong, Sarawak (H. W. Smith).

*230. POLYRHACHIS (MYRMHOPLA) OEDACANTHA, sp. nov.

Worker. Length 4 mm.

Related to *P. hippomanes* Smith and *atrovirens* Emery. Head elliptical, longer than broad, semicircularly rounded behind with feebly convex sides and equally convex dorsal and gular surfaces. Eyes moderately convex, their anterior orbits at the median transverse diameter of the head. Mandibles with rather rounded external borders, the apical borders with 5 subequal teeth. Clypeus carinate at the base, its anterior border broadly rounded and somewhat crenulate. Frontal area distinct, triangular. Frontal carinae approximated, sinuous, a little further apart behind than in front; frontal groove absent. Antennae long and slender, their scapes extending fully ⅖ their length beyond the posterior border of the head. Thorax from above elongate trapezoidal, broadest through the humeri, evenly, longitudinally, and transversely rounded and convex above, with distinct promesonotal and mesoëpinotal sutures. Pronotum about 1½ times as broad as long, its anterior corners produced as flattened, triangular and slightly upturned teeth. Mesonotum of the same length as the pronotum; epinotum very short, without distinct base, but sloping abruptly from the mesoëpinotal suture which lies just in front of the spines. These are long, stout, and acute, as long as the declivity, widely separated and curved at their bases, with slightly sinuous tips, directed backward, upward, and outward. Petiole in profile with straight, not angulate, anterior and slightly convex posterior surface, armed above with a pair of stout spines, longer and stouter than those of the epinotum, constricted at the base and distinctly swollen in the middle, curved and tapering, directed outward and backward around the base of the gaster. The distance between their tips is a little less than the greatest diameter of the gaster, which is subglobose, distinctly broader than long, with $\frac{2}{3}$ of its surface formed by the first segment. Legs moderately long, tibiae cylindrical, strongly constricted at their bases, without bristles on their flexor surfaces.

Head, thorax, petiole, and legs subopaque; mandibles very finely striated and sparsely punctate; head, thorax, and petiole densely and uniformly punctate, thoracic dorsum also with scattered, shallower punctures; epinotal and petiolar spines longitudinally rugulose. Gaster shining, more finely and more superficially punctate than the head and thorax. Legs finely and sharply shagreened.

Hairs and pubescence whitish, the former only on the venter, tip of gaster, clypeus, and mandibles, the latter very fine, distinct only on the gaster, which has a slightly pruinose appearance.

Black; head, thorax, and petiole with indistinct purplish metallic reflections, more greenish on the occiput. Palpi, tibiae, femora, and middle and hind coxae red, tips of femora and constricted bases of the tibiae more or less infuscated.

Described from a single specimen taken by Mr. John Hewitt at Kuching.

This species, though closely related to *P. hippomanes*, *paromalus*, *mucronata*, and *atrovirens*, is easily distinguished by the robust, somewhat fusiform epinotal spines. It is perhaps merely a subspecies of *hippomanes*, although the petiole does not agree with Smith's figure of the type from Celebes. It is certainly very different from the subsp. *ceylonensis* Emery, represented in my collection by a couple of specimens received from Professor Forel.

231. POLYRHACHIS (CYRTOMYRMA) RASTELLATA (Latreille).

Formica rastellata Latreille, Hist. nat. fourmis, 1802, p. 130, ♀.
Polyrhachis rastellata Smith, Cat. Hymenop. Brit. mus., 1858, **6**, p. 59.

Type-locality: East Indies (Riche).
Sarawak (Doria and Beccari).

232. Polyrhachis (Cyrtomyrma) laevissima Smith.

Polyrhachis laevissimus Smith, Cat. Hymenop. Brit. mus., 1858, **6**, p. 64, ☿, pl. 4, fig. 42.
Polyrhachis globularia Mayr, Tijdschr. ent., 1867, **10**, p. 41, ☿.
Polyrhachis laevissima Mayr, Verh. Zool. bot. gesellsch. Wien, 1878, **28**, p. 651, ♀.
Polyrhachis levissima Dalla Torre, Cat. Hymenop., 1893, **7**, p. 264.

Type-locality: Burmah.
Kapouas Basin, Borneo (Chaper).

233. Polyrhachis (incertae sedis) castaneiventris Smith.

Polyrhachis castaneiventris Smith, Cat. Hymenop. Brit. mus., 1858, **6**, p. 67, ♀.

Type-locality: Sarawak, Borneo (A. R. Wallace).

234. Polyrhachis (incertae sedis) nitida Smith.

Polyrhachis nitidus Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 61, ♀.
Polyrhachis nitida Dalla Torre, Cat. Hymenop. 1893, **7**, p. 266.

Type-locality: Sarawak, Borneo (A. R. Wallace).

235. Polyrhachis (incertae sedis) ruficornis Smith.

Polyrhachis ruficornis Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 60, ♀.

Type-locality: Sarawak, Borneo (A. R. Wallace).
This is probably the female of *P. bicolor* Smith.

236. Polyrhachis (incertae sedis) constructor Smith.

Polyrhachis constructor Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 60, ♀ (*nec P. constructor* Smith, Cat. Hymenop. Brit. mus., 1858, **6**, p. 68).

Type-locality: Sarawak, Borneo (A. R. Wallace).

237. ECHINOPLA LINEATA Mayr.

Echinopla lineata Mayr, Verh. Zool. bot. gesellsch. Wien, 1862, **12**, p. 689, ☿.

Type-locality: Singapore.
Sarawak (Doria and Beccari).

238. ECHINOPLA MELANARCTOS Smith.

Echinopla melanarctos Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 79, ☿, pl. 25, fig. 29.

Type-locality: Singapore (A. R. Wallace).
Sarawak (Doria and Beccari; Haviland).

239. ECHINOPLA PALLIPES Smith.

Echinopla pallipes Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 80, ☿.
Echinopla pallidipes Dalla Torre, Cat. Hymenop., 1893, **7**, p. 272.

Type-locality: Sarawak, Borneo (A. R. Wallace).
A single worker from Kuching (John Hewitt).

240. ECHINOPLA RUGOSA Ern. André.

Echinopla rugosa Ern. André, Mém. Soc. zool. France, 1892, **5**, p. 47, ☿.

Type-locality: Kapouas Basin, Borneo (Chaper).

241. ECHINOPLA STRIATA Smith.

Echinopla striata Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 80, ☿.

Type-locality: Malacca (A. R. Wallace).
Sarawak (Doria and Beccari).
Three workers from Serambu Mt., Sarawak (H. W. Smith).

242. ECHINOPLA SUCKI Forel.

Echinopla sucki Forel, Mitth. Naturh. mus. Hamburg, 1901, **18**, p. 75, ☿.

Type-locality: Tandjong, N. E. Borneo (Fritz Suck).
Three workers from Kuching (John Hewitt).

243. ECHINOPLA TRITSCHLERI Forel.

Echinopla tritschleri Forel, Mitth. Naturh. mus. Hamburg, 1901, **18**, p. 74, ☿ ♀.

Type-locality: Indrapura, Sumatra (Tritschler).
Tandjong, S. E. Borneo (Fritz Suck).

BORNEAN SPECIES INCERTAE SEDIS.

244. CERAPACHYS OCULATUS Smith.

Cerapachys oculatus Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 74, ♂.

Type-locality: Sarawak, Borneo (A. R. Wallace).

245. PONERA APICALIS Smith.

Ponera apicalis Smith, Journ. Proc. Linn. soc. London. Zool. 1857, **2**, p. 66, ♀.

Type-locality: Sarawak, Borneo (A. R. Wallace).

246. PONERA POMPILOIDES Smith.

Ponera pompiloides Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 69, ♂.

Type-locality: Sarawak, Borneo (A. R. Wallace).

247. PONERA VIDUA Smith.

Ponera vidua Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 68, ♂.

Type-locality: Sarawak, Borneo (A. R. Wallace).

248. ATTA PENETRANS Smith.

Atta penetrans Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 77, ♀.
Aphaenogaster penetrans Dalla Torre, Cat. Hymenop., 1893, **7**, p. 104.

Type-locality: Sarawak, Borneo (A. R. Wallace).

249. ATTA CINGULATA Smith.

Atta cingulata Smith, Journ. Proc. Linn. soc. London. Zool., 1857, **2**, p. 77, ☿.
Aphaenogaster cingulata Dalla Torre, Cat. Hymenop., 1893, **7**, p. 102.

Type-locality: Sarawak, Borneo (A. R. Wallace).

POSTSCRIPT.

A series of specimens, which Prof. C. F. Baker of Manila, P. I. collected at Sandakan, Borneo and sent me too late to be included in the foregoing revision, comprises several interesting and four new species.

1. CERAPACHYS ANTENNATUS Smith. (*Ante* p. 45).

Male. Length about 7 mm.

Long and slender. Head, including the eyes, as broad as long, the eyes large, fully $\frac{1}{3}$ as long as the sides of the head and situated a little in front of its middle. Mandibles shaped as in the worker, their apical borders well-developed and finely denticulate. Clypeus indistinctly carinate behind, its anterior border broadly rounded and entire. Antennae long and stout, scapes somewhat longer than the three basal funicular joints together; first funicular joint as long as broad, the second broader than long, the remaining joints longer than broad, gradually increasing in length to the tip. Thorax through the wing-insertions as broad as the head through the eyes, mesonotum feebly convex, with pronounced Mayrian furrows. Epinotum in profile angular, with subequal base and declivity, the latter flat, seen from behind subcircular, strongly marginate both above and on the sides. Petiole subcylindrical, $1\frac{2}{3}$ times as long as broad, sharply truncated and marginate in front. Postpetiole broader than the petiole, broader behind than in front, also $1\frac{2}{3}$ times as long as broad, with evenly convex dorsal, lateral, and ventral surfaces.

Gaster very long and narrow, broadest in the middle, the basal half formed by the first segment. Genital appendages small and retracted. Legs rather long and slender.

Shining; mandibles very sparsely, coarsely, and irregularly punctate. Clypeus feebly striolate. Head finely and rather regularly longitudinally rugose on the front, irregularly punctate-rugulose behind. Thorax coarsely and transversely foveolate along the sutures and Mayrian furrows and coarsely and sparsely foveolate on the surfaces of the sclerites. Pronotum longitudinally rugose. Base of epinotum coarsely and vermiculately rugose, the declivity finely and densely punctate-rugulose. Petiole above with a few strong, undulating longitudinal rugae, becoming more reticulate on the sides. Postpetiole, gaster, and legs smooth, with minute, sparse, piligerous punctures.

Hairs as in the worker, and most abundant on the apical portion of the gaster.

Black; mandibles, genitalia, and tips of tarsi reddish. Wings grayish hyaline, with large black pterostigma and dark brown veins.

Described from a single specimen, which must, I believe, represent the hitherto unknown male of *C. antennatus* though the sculpture of the head, thorax, and petiole is very different from that of the worker.

*2. Myopopone castanea Smith ♀.

3. Platythyrea pusilla Emery ♀ (*Ante*, p. 50).

*4. Bothroponera sandakana, sp. nov.

Female. Length about 14 mm.; wings 11 mm.

Allied to *rufipes* Jerdon and *insularis* Emery. Head, excluding the mandibles, broader than long and considerably broader behind than in front, with broadly excavated posterior border and nearly straight sides. Posterior orbits of the moderately large and convex eyes at the median transverse diameter of the head. Mandibles large and rather convex above, not flattened as in *rufipes*, their apical borders finely and rather evenly serrate. Clypeus short, strongly carinate, truncated anteriorly in the middle; the anterior border entire, straight, and transverse. Antennae short and stout, scapes reaching nearly to the middle of the occipital border, all the funicular joints, except the first and last, distinctly broader than long. Thorax through the wing-insertions a little narrower than the head. Epinotum sharply angular in profile, the base feebly convex and distinctly shorter than the concave, sloping declivity, which has a marked, crenulate border, both above and on the sides. Petiole higher than thick, as thick above as below, truncated in front and behind, convex above and on the sides, the posterior surface slightly concave but with its superior border merely sub marginate and not denticulate. Gaster and legs of the usual form.

Mandibles shining, very coarsely and sparsely punctate, with a few coarse rugae near the base. Remainder of body subopaque, densely punctate; head, thorax, and petiole also covered with sparse but rather regular foveolae, which are more pronounced on the posterior portion of the head, sides of thorax, and on the petiole. Epinotal declivity rather shining, very minutely punctate. Postpetiole and first gastric segment longitudinally but much less sharply costate than in *rufipes*, the spaces between the costae with shallow foveae having sharper anterior margins. These foveae become much more distinct on the sides of the segments. Legs with sparse piligerous punctures.

Hairs and pubescence golden, abundant and rather long, the pubescence appressed on the head, gaster, and appendages, more oblique on the thoracic dorsum, nearly absent on the pleurae. Hairs longest on the abdomen, especially on the apical segments.

Dark brown; mandibles blackish; legs, including the coxae, posterior borders of gastric segments, wing-insertions, epinotum and petiole reddish. Wings rather heavily infuscated, with blackish stigma and brown veins.

A single specimen. I describe this large ant with some reluctance. It is certainly not a form of *rufipes* or of *insularis*, judging from Emery's very brief description of the worker of the latter species. Professor Baker sent me from Singapore a female specimen which evidently represents a variety of *insularis*, and I possess a worker from Ceylon labeled "*insularis*" by Forel. Though these specimens have the mandibles much like those of *sandakana* in being shining, convex, and without the fine, longitudinal striae of *rufipes*, the petiole has a sharp denticulate postero-superior border. According to Emery, the petiole is also costate in the typical *insularis* and this is the case in my Ceylonese specimen.

5. BOTHROPONERA TRIDENTATA (Smith) ☿ ♂ (*Ante*, p. 55).

Male. Length nearly 10 mm.

Head through the very large, convex, and reniform eyes broader than long, flat above, with evenly rounded posterior border and very short cheeks, the eyes occupying nearly the whole of the sides of the head. Ocelli large and prominent. Mandibles small, flat, edentate. Palpi very long, the labial pair 3-, the maxillary pair 5-jointed, the three terminal joints of the latter long and attenuated. Clypeus feebly convex, ecarinate, with straight, entire anterior border. Antennae very long and slender, filiform; scape short, only twice as long as broad, the first funicular joint as broad as long, the remaining joints cylindrical, gradually diminishing in length towards the tip. Thorax somewhat broader through the wing-insertions than the head. Pronotum transverse, truncated in front; mesonotum as long as broad, feebly convex above, without

Mayrian furrows; scutellum very convex; epinotum in profile strongly angular, both the base and declivity concave, the former shorter than the latter, the two surfaces separated by a pronounced, subcircular margination or carina. Petiole like that of the worker but with the three blunt teeth on the posterosuperior border much less prominent, the ventral surface with two strong teeth, the anterior directed downward and forward, the posterior somewhat longer and more slender, directed downward and backward. Postpetiole broader than long, evenly and convexly rounded in front, strongly marked off from the broader and very short gaster, the last segment of which terminates in a long, stout, downwardly curved spine. Genitalia deeply retracted. Legs slender.

Subopaque; postpetiole, gaster, and legs shining. Head very finely punctate; thorax densely punctate, the pro- and mesonotum and mesopleurae also with indistinct, scattered foveolae. Scutellum and epinotum irregularly rugose, the declivity of the latter more finely, so that its surface is somewhat shining. Petiole coarsely reticulate-rugose, its truncated posterior surface finely rugulose. Postpetiole, gaster, and legs smooth, with fine piligerous punctures.

Hairs and pubescence as in the worker, but shorter.

Head, postpetiole, and gaster castaneous; thorax and petiole black, neck and discal portion of mesonotum red; antennae, palpi, and legs, including the coxae, yellow, the tibiae streaked with fuscous or black. Wings clear yellowish hyaline; pterostigma brown, veins yellow.

A single specimen, which I have described in detail, because very few Bothroponera males have been seen.

*6. Pseudoponera amblyops (Emery) ♀.

*7. Trapeziopelta breviloba, sp. nov.

Female. Length 5.8 mm.

Head, excluding the mandibles, a little broader than long, slightly broader behind than in front, with feebly rounded sides and feebly and broadly excised occipital border. Eyes rather convex, longer than their distance from the anterior corners of the head. Ocelli small and close together. Mandibles distinctly shorter than the head, slender and terete at the base, dilated and flattened apically, their inner borders with three separated teeth; the most basal merely a low, rounded convexity, the others stronger and decidedly acute. Lobe of clypeus very short, rectangular, more than twice as broad as long, its anterior border slightly concave. Oral border of clypeus with a median, slender, truncated tooth. Frontal groove strongly impressed. Antennal scapes not reaching to the posterior border of the head; funiculi with distinctly 4-jointed club; joints 2–7 slightly broader than long; joints 8–10 onger than broad; terminal joint nearly as long as the three remaining joints of the club together. Thorax 2½ times as long as broad, parallel-sided, distinctly narrower than the head, flattened above; pronotum, excluding the neck, about as long as the mesonotum; base and declivity of epinotum forming nearly a right angle in profile, the declivity slightly concave. Petiole, postpetiole, and gaster together but little longer than the thorax, the petiole truncated anteriorly and posteriorly, higher than long, from above broader than long and broader behind than in front, with rounded dorsal and lateral surfaces, its ventral surface in front with a blunt, compressed tooth. Postpetiole rather strongly constricted behind, its anteroventral surface with an acute, downwardly directed tooth. Sting long and compressed.

Smooth and shining; head, thorax, and abdomen with small, sparse, inconspicuous, piligerous punctures.

Hairs yellow, bristly, pointed, of uneven length; sparser on the body and legs, suberect on the former, oblique on the latter; more abundant but short on the antennae.

Deep red; antennae, legs, and mandibles slightly yellowish red. Wings uniformly brown, with dark brown veins and conspicuous black pterostigma.

Described from a single specimen.

This does not seem to be the female of any of the described species, nearly all of which are known only from worker specimens. It is evidently most closely related to the Papuan *T. laevigata* Emery, the female of which is still to be discovered.

8. Dorylus laevigatus (Smith) ♂. (*Ante*, p. 61).

9. Tetraponera attenuata Smith ☿ ♀ ♂. (*Ante*, p. 65).

10. Tetraponera difficilis Emery (?) ♀. (*Ante*, p. 65).

11. Tetraponera pilosa (Smith) ☿ ♀. (*Ante*, p. 65).

12. Myrmicaria arachnoides (Smith) subsp. melanogaster Emery ♀. (*Ante*, p. 71).

13. Vollenhovia rufiventris Forel ♀. (*Ante*, p. 79).

*14. Vollenhovia oblonga Smith var. (?) ♀.

15. Pristomyrmex trachylissus (Smith) ♀. (*Ante*, p. 86).

*16a. Paratopula, gen. nov. ceylonica (Emery) var. sumatrensis (Forel) ♀.

I have received all three phases of this ant from the Philippines (F. X. Williams). The typical form of the species, originally described as *Atopomyrmex ceylonicus*, has recently been placed by Forel in the genus Leptothorax. As I cannot agree with this allocation and as the species cannot be left in Atopula, I have coined a new generic name, PARATOPULA.

17. MERANOPLUS MUCRONATUS Smith ☿. (*Ante*, p. 90).

18. CATAULACUS GRANULATUS (Latreille) ♀. (*Ante*, p. 92).

19. CATAULACUS HISPIDULUS Smith ☿. (*Ante*, p. 93).

20. CATAULACUS LATISSIMUS Emery ☿. (*Ante*, p. 94).

*21. MYRMOTERAS BAKERI, sp. nov.

Female. Length nearly 4 mm.

Very similar to *M. donisthorpei* Wheeler, but differing in the following characters: the five large teeth along the apical half of the mandibles are distinctly longer and stouter, though alternating with shorter teeth as in *donisthorpei*, whereas the denticles on the basal half are very small and almost obsolete; the frontal carinae are somewhat further apart; the lateral lobes of the head just behind the eyes are more acutely angular; the petiolar node is much more compressed anteroposteriorly so that its upper border is transverse and rather sharp; the middle and hind tibiae are less strongly swollen in the middle and the sculpture and color are different. The head is very smooth and shining like the remainder of the body, and the insect is honey-yellow, with the mandibles, except their brownish teeth, the femora and tarsi paler, whitish yellow. The middle portion of the first gastric segment and the bases of the succeeding segments are brownish. The pilosity and wing-venation are as in *donisthorpei*, but the erect hairs on the scapes, body and legs are somewhat coarser and more bristly.

Male. Length 3 mm.

Head through the eyes broader than long, gradually contracted and rounded behind, without the peculiar lobular eminences of the female, to the concave and marginate occipital border. Eyes large, but placed far forward, so that the cheeks are very short. Ocelli small. Mandibles very small, vestigial, bluntly pointed, edentate. Clypeus, frontal carinae, and antennae much as in the female, except that the antennae are 13-jointed. Thorax, gaster, and legs as in the female; middle and hind tibiae less incrassated, petiolar node thicker and much blunter above. Genital appendages small, exserted, superficially like those of Prenolepis. Wings as in the female, with the same peculiar venation.

Smooth and shining; thorax subopaque, finely punctate-rugulose.

Pilosity as in the female but somewhat sparser and finer.

Castaneous brown; pronotum and head paler and more reddish; palpi and tarsi beyond the first joint, whitish.

Described from a single female and three males. More material may show that this form is merely a pale race, or subspecies of *donisthorpei*. The color of the female before me is certainly not due to immaturity. Dr. F. X. Williams has recently sent me a male and female of another species, *M. williamsi*, sp. nov., from the Philippines, the fourth species of this remarkable genus to come to light in the Malayan subregion. The female is larger and more robust than *donisthorpei* and *bakeri*, with the head and thorax rich reddish brown, opaque, and very finely and densely punctate and the basal half of the swollen middle and hind tibiae black, the apical half yellow. The male is black, with pale terminal tarsal joints and the head and thorax are densely punctate-rugose. The worker is known only of the type-species, *M. binghami* Forel of Burma.

22. CAMPONOTUS (MYRMOTARSUS) MISTURA (Smith) ☿. (*Ante*, p. 109).

*23. CAMPONOTUS (MYRMOTARSUS) SATAN, sp. nov.

Female. Length: 18 mm.; wings 19 mm.

Head subtrapezoidal, broader than long without the mandibles, much broader behind than in front, with straight sides and broadly excised posterior border. Eyes moderately large and convex. Mandibles large, convex, with 6 large, subequal teeth. Clypeus broader than long, rather flat, ecarinate; its anterior margin straight and transverse in the middle, with a small tooth in each side and feebly concave lateral to each tooth. Frontal carinae slightly diverging behind and not strongly curved. Antennal scapes decidedly flattened, reaching to the posterior corners of the head. Thorax and legs as in the other species of the subgenus. Petiole broad, cuneate in profile, its anterior and posterior surfaces flat, its superior margin moderately sharp, feebly and sinuately emarginate. Gaster considerably shorter than the thorax. Tibiae and middle and hind metatarsi flattened as in other species of the subgenus. Wings long.

Very smooth and shining except the sides of the thorax and the top of the head, which are opaque. Mandibles, clypeus, and cheeks sparsely punctate, the punctures becoming finer and denser on the sides of the head; the opaque dorsal portion sharply and finely coriaceous.

Hairs black, rather short, coarse, moderately abundant, erect, absent on the cheeks but covering the body and appendages, short on the scapes; venter and borders of gastric segments above, and lower surfaces of tarsal joints with short, appressed fulvous hairs. Pubescence absent.

Deep black; terminal tarsal joints reddish. Wings brown with resin colored veins and apterostigma bordered with darker brown.

A single specimen. This species is quite distinct in the shape of the head, sculpture and color of the pilosity.

24. CAMPONOTUS (MYRMOSPHINCTA) CAMELINUS (Smith) ☿. (*Ante*, p. 111).

24a. CAMPONOTUS (MYRMOSPHINCTA) CAMELINUS var. SINGULARIS (Smith) ☿. (*Ante*, p. 112).

25. POLYRHACHIS BIHAMATA (Drury) ☿ ♀. (*Ante*, p. 121).

26. POLYRHACHIS (MYRMA) VINDEX Smith ☿. (*Ante*, p. 125).

A single specimen, differing from the typical form described on p. 125 in having the legs entirely black.

27. POLYRHACHIS (MYRMHOPLA) ARMATA (Le Guillou) ☿. (*Ante*, p. 129).

28. POLYRHACHIS (MYRMHOPLA) FURCATA Smith ♀. (*Ante*, p. 131).

29. POLYRHACHIS (MYRMHOPLA) CHALYBEA Smith ☿. (*Ante*, p. 131).

30. POLYRHACHIS (MYRMHOPLA) CEPHALOTES Emery ☿. (*Ante*, p. 132).

31. POLYRHACHIS (CYRTOMYRMA) RASTELLATA (Latreille) ☿. (Ante, p. 136).

A specimen with the legs entirely black.

32. ECHINOPLA PALLIPES Smith ☿. (*Ante*, p. 138).

Bulletin of the Museum of Comparative Zoölogy
AT HARVARD COLLEGE.
Vol. LXIII. No. 4.

REPORTS ON THE SCIENTIFIC RESULTS OF THE EXPEDITION TO THE TROPICAL PACIFIC IN CHARGE OF ALEXANDER AGASSIZ, ON THE U. S. FISH COMMISSION STEAMER "ALBATROSS," FROM AUGUST, 1899, TO MARCH, 1900, COMMANDER JEFFERSON F. MOSER, U. S. N., COMMANDING.

XXI.

THE BIRDS.

By Charles Haskins Townsend and Alexander Wetmore.

Published by Permission of H. M. Smith, U. S. Fish Commissioner].

CAMBRIDGE, MASS., U. S. A.:
PRINTED FOR THE MUSEUM.
August, 1919.

No. 4.— *Reports on the scientific results of the Expedition to the Tropical Pacific in charge of Alexander Agassiz, on the U. S. Fish Commission Steamer Albatross, from August,* 1899, *to March,* 1900, *Commander Jefferson F. Moser, U. S. N., Commanding.*

XXI.

The Birds.

By Charles Haskins Townsend and Alexander Wetmore.

Part 1.— *Introduction and Field Notes.* By Charles Haskins Townsend.

The voyage of the U. S. Fisheries Steamer Albatross during the winter of 1899 and 1900, under the direction of Mr. Alexander Agassiz, was undertaken for the purpose of studying the coral-reef districts of the Tropical Pacific, making deep-sea explorations in the great ocean basins, and conducting investigations of the fisheries among the islands. A minor object of the expedition was the study of the fauna and flora of oceanic islands, but it became necessary to restrict this part of the program in order to investigate more thoroughly the structure and formation of coral reefs and islands.

The activities of the scientific staff took various directions at the islands visited, ornithology receiving some attention. The collection of birds brought back, ninety-three distinct forms and 406 specimens, does not represent any systematic effort to secure birds. It is rather the result of opportunities embraced from time to time, as the progress of the expedition permitted. Our stops were generally brief, except at points where coal or other supplies were renewed and some of these were islands already well known to ornithologists.

The preparation of bird skins being largely dependent upon the personal efforts of the writer, there was naturally a limit to the number which could be preserved. This usually meant night work, after the ship's laboratory had been cleared of the day's deep-sea dredgings, or the marine gatherings from the reefs. In the pleasanter work of collecting, assistance was more often available. Occasionally it became necessary to store birds in the ship's ice room for several days until an opportunity could be found to preserve them properly.

Specimens were obtained on thirty-three different islands. It is to be regretted that more time could not have been spent in exploring certain well-forested islands, where unknown land birds may exist. The atolls and reefs yielded little but the widely distributed water birds.

The time of year spent among these islands lying so near the equator, that is our winter season, may explain the fact that no nests of resident land birds were seen.

It is evident that observations on the habits of birds could seldom be made during such hurried trips as we made ashore.

The expedition proceeded in turn through the Marquesas, Paumotu, Society, Cook, Tonga, Fiji, Ellice, Gilbert, Marshall, Caroline, and Ladrone Archipelagoes. These have been classified as Eastern Polynesia, comprising the Marquesas, Paumotu, Society, and Cook Groups; Central Polynesia, including the Samoan, Tonga, and Fiji Groups; the Central Coral Islands, of the Ellice, Gilbert, and Marshall Atolls, and Northwestern Polynesia, with the Caroline and Ladrone Groups.

Although the collection of birds brought back by the ALBATROSS is far from being a representative one, new species were met with in more than half of the groups visited, a fact indicating that there is still much to be learned about the birds of Polynesia. Some of the larger and better known islands have been but little explored ornithologically, and many of the smaller ones not at all. It is probable that the Fiji Archipelago with its 150 islands will eventually yield new birds.

Our knowledge of Polynesian birds does not extend much further back than the time of the United States Exploring Expedition, 1838 to 1842, under Captain Charles Wilkes, when extensive collections were made by Titian R. Peale, Zoölogist of the Expedition.

A period of about a quarter of a century appears to have elapsed before ornithological researches in this region were resumed. Since then there have been many contributions to the ornithology of Polynesia. More than 200 species of strictly land birds are now known to the archipelagoes visited by the ALBATROSS. As many of the genera prevail for thousands of miles through the region, the presence of its avifauna may be explained as the result of immigration. The distribution of a few species has been extended through the agency of human beings.

The long-delayed appearance of this report is due to the fact that the present writer left Washington soon after the return of the ALBATROSS and never had an opportunity to study the collection of birds brought back and placed in the U. S. N. M. He is deeply indebted to Mr. Wetmore for the careful study he has made of the material.

The ALBATROSS sailed from San Francisco on 23 August, 1899, arriving at the Marquesas Islands 15 September, having occupied twenty-seven sounding and dredging stations in depths varying from 687 to 3,088 fathoms on the way. Hydrographic work was carried on not only during the passage from one archipelago to another, but also at points among the islands composing the different groups.

THE MARQUESAS ISLANDS.— These are all high islands of volcanic origin and without coral reefs. The group consists of nine principal islands, with some outlying islets of small size.

The ornithology of the Marquesas, with the exception of Nukuhiva and Hiva-oa, is unknown. Most of the eleven land birds previously known came from the latter and its outlying island Tahuata or St. Christina. All of the larger islands are forested and may yield much of interest to naturalists. These are Motu Hiva, eight miles in length by four in width and over 3,600 feet high; Tau Ata, nine miles long by five wide and 3,200 feet high; Na-pu, about seven miles in diameter with a height of 4,000 feet; Ua-huka, measuring seven by five miles, and Eiao, six miles long and 2,000 feet in height.

NUKUHIVA, also called Marchand, was the only island of the Marquesas Group visited by the ALBATROSS, the vessel lying at anchor in the harbor of Tai-o-haé from 15–17 September. It is the largest of the Marquesas, being fourteen miles in length and ten in width. The island is mountainous, one peak rising to a height of 3,900 feet, with others nearly as high, while most of it is very rugged. The heads of some of the valleys are faced with steep cliffs, and there are many cascades falling from considerable heights. There are fertile valleys, little cultivated owing to a decreasing population, which now numbers less than 1,000. Nukuhiva is well forested and has the fruits common to Polynesian Islands.

Our stay was too short for anything more than desultory collecting of birds in the vicinity of the anchorage. It is quite possible that Nukuhiva has other birds than the species we obtained.

The land birds secured were Jungle cock (*Gallus gallus*), fruit pigeon (*Ptilopus dupetithouarsii*), swift (*Collocalia ocista*), and warbler (*Conopoderas percernis*), the last being a new species. All of these are common. The water birds were *Heteractitis incanus* and *Gygis microrhyncha*. The White noddy (*Gygis microrhyncha*) of which four specimens were secured, was seen high up in the mountains, flying across deep, forested ravines and occasionally observed resting on the trees. It also nests in trees. This species is apparently restricted to the Marquesas. Tropic birds (*Phaëthon rubricaudus*) were also seen in the mountains at Nukuhiva. It was not uncommon for them to approach the vessel when we stopped for deep-sea sounding or dredging, and specimens shot from the deck could easily be recovered by lowering a boat. The first tropic birds were observed 600 miles northeast of the Marquesas.

Gallus has long been wild on the mountains of Nukuhiva. All the specimens that I killed looked very much like the richly colored one that was preserved. It was very interesting to hear the cocks crowing in the high woods. I found that they could fly like pheasants, making strong flights across wide ravines.

The large, thrush-like warbler of Nukuhiva (*Conopoderas percernis*) is the most interesting bird of the island and by far the best songster we heard in Eastern Polynesia. It is not uncommon to hear several of them singing loudly on a single tree. Herman Melville in "Typee" that classic of the Marquesas, says, "Birds, bright and beautiful birds, fly over the valley of Typee . . . but alas the spell of dumbness is upon them all — there is not a single warbler in the valley." This statement is altogether at variance with our experience. Everywhere about the village of Tai-o-hae, only a few miles from the valley of Typee, the woods rang with the melody of the warblers. This species is the size of a mockingbird and its sulphur-yellow under parts render it quite conspicuous.

THE PAUMOTU ISLANDS.— After leaving the Marquesas, the ALBATROSS proceeded through the Paumotu, Tuamotu, or Low Archipelago, making brief stops at a dozen of the islands. There are seventy-eight islands in this Group, the main body of which is more than a thousand miles in length. With few exceptions they are atolls with enclosed lagoons of considerable size. The atolls are usually well forested with cocoanut trees, the principal species, and with low trees and shrubs. They do not vary much in vegetation or general appearance. The population is limited, the entire Archipelago having not more than 4,000 inhabitants. The lagoons yield much valuable pearl shell, but the export of copra is probably of greater importance.

Our first anchorage was at Rangiroa, where the ALBATROSS remained at anchor from 21–24 September. Rangiroa, also called Rahiroa, Vliegen, Deans, and Nairsa, is an atoll with a great lagoon more than forty miles in length. The land birds obtained were the Blue lory (*Choriphilus peruvianus*) and a warbler (*Conopoderas atypha nesiarcha*), the latter described as new (p. 210).

The small Blue lory (*Choriphilus peruvianus*) obtained at Rangiroa and later at Bora Bora and Aitutaki, is a fairly common species and is often kept as a pet by the natives, a custom which has aided its distribution. One which I secured at Rangiroa became very tame, and lived on board the ALBATROSS for several weeks, when it was drowned by falling into a pail of water. Its greatest delight was to walk back and forth on a light rope stretched across my stateroom. The water birds obtained were *Heteractitis incanus*, *Megalopterus melanogenys*, *Procelsterna cerulea*, and *Sterna lunata*.

MAKATEA, (Metia, Aurora, Recreation), where the ALBATROSS made a brief stop on 26 September, was revisited for a few hours on 6 October. It is one of the few elevated islands in the Paumotus, having a height of over 200 feet, with perpendicular cliffs along the north shore. It has a length of five miles and is densely wooded, with many large trees. The higher parts are difficult to penetrate with the thickly tangled vegetation and massed pinnacles of sharply weathered limestone. Our stay was too brief to permit of collecting more than a few yards distant from the shore. The land birds found here were fruit pigeon (*Ptilopus coralensis*), large pigeon (*Globicera aurorae*), and warbler (*Conopoderas atypha erema*), the last being new. All are common. The water birds were *Pluvialis dominicus fulvus*, *Phaeopus tahitiensis*, and *Anous stolidus pileatus*. This was our first meeting with the large pigeon Globicera. It is rather common and was observed later at Tahiti. This bird is called Ru-pee by the natives. The dense forests of Makatea doubtless harbor species of land birds which could only maintain themselves with difficulty in the scattered cocoanut groves of the atolls.

NIAU, also called Creig and Faau, is an atoll about four miles in diameter and is well wooded. It is somewhat higher than the neighboring atolls, having an elevation of twenty-six feet. Our stop on 7 October of two hours afforded little time for collecting. The only bird obtained was the fruit pigeon (*Ptilopus coralensis*) which is abundant.

APATAKI, sometimes called Hagemeister, is a partly wooded atoll eighteen miles in diameter. Anchoring on the evening of 7 October and sailing the following morning, only one bird was secured, a warbler (*Conopoderas atypha agassizi*), which, however, proved to be undescribed.

TIKEI, or Romanzoff, is a small, well-wooded island about three miles in diameter and with no central lagoon. The ALBATROSS anchored at Tikei for a few hours on 8 October. The only birds collected were *Conopoderas atypha atypha* and *Pluvialis dominicus fulvus*. I found here the egg of a White-crowned black noddy balanced precariously upon the horizontal limb of a low Pandanus, the parent bird covering it until I was almost near enough to seize it.

FAKARAVA, (Fakarawa, Wittgenstein), is one of the more important atolls, being about thirty miles in length and having three entrances to the great lagoon available for vessels. It is rather irregularly wooded. Although the ship remained from 10–14 October and numerous birds were collected, there were only two species, *Ptilopus coralensis* and *Conopoderas atypha atypha* (new).

Although at work among the islands for several days after leaving Fakarava, no anchorages were made until Makemo was reached on 19 October, where the vessel remained until the 25th. The only land birds found were *Ptilopus coralensis* and *Conopoderas atypha crypta* (new). The water birds collected were *Fregata ariel ariel, Pluvialis dominicus fulvus, Phaeopus tahitiensis, Heteractitis incanus, Anous stolidus pileatus, Megalopterus melanogenys* and *Thalasseus bergii rectrirostris.*

The Crested tern (*Thalasseus bergii rectirostris*) is rather common among the Paumotu Islands. At Makemo we found it frequently perching on stakes or piles along the shore of the lagoon near the village. The other sea birds found here are common throughout the Paumotus. Makemo, also called Philip Island, is a large atoll about forty miles in length, the northern part of which is well wooded.

TEKOKOTO, (Tekareka, Doubtful Island), visited 26 October, is nothing more than a tiny atoll a mile or so in diameter with a shallow lagoon. It is only a few feet high, a part of it being covered with bushes. These were heavily loaded with frigate birds and boobies, great numbers of them flying over the whale-boat as we searched for a landing. The surf proved altogether too boisterous for safety and the attempt was abandoned. We found frigate birds more numerous at Tekokoto than at any other island visited during the voyage. The natives of the Paumotus often keep tame frigate birds on perches near their houses. The birds are reared in captivity and are used after the manner of homing pigeons to carry messages among the islands.

It appears that the birds return promptly when liberated from quite distant islands. They are distributed by being put aboard small vessels trading among the islands. The birds are liberated whenever there is news to be carried, returning to their perches sometimes in an hour or less, from islands just below the horizon and out of sight of the home base. Generally they are in no great hurry. As the food of a frigate bird may be picked up almost anywhere at sea, there is no means of ascertaining how much time the bird loses in feeding *en route.*

It may also linger to enjoy its liberty with other frigate birds. At home it is usually tethered to its perch.

Mr. Louis Becke says they were used as letter carriers on the Samoan Islands when he was there in 1882, carrying messages between islands sixty or eighty miles apart. When he lived on Nanomaga in the Ellice Islands, he exchanged two tame frigate birds with a trader living on Nuitao, sixty miles distant, for a tame pair reared on that island. The four birds at liberty frequently passed from one island to the other on their own account, all going together on visits to each other's homes, where they were fed by the natives on their old perches. Mr. Becke's pair usually returned to him within from twenty-four to thirty-six hours. He tested the speed of the "frigate" by sending one of his birds by vessel to Nuitao where it was liberated with a message at half-past four in the afternoon. Before six o'clock of the same day the bird was back on its own perch at Nanomaga, accompanied by two of the Nuitao birds, which not being at their perch on that island when it was liberated, it had evidently picked up on its way home.

The tame frigate bird returns regularly to its home perch at night. The use of the frigate bird as a carrier is referred to by the Rev. Dr. George Turner in Samoa a Hundred Years Ago, page 282.

The Albatross did not anchor at Akiaki, but I made a hasty landing 30 October, obtaining specimens of a warbler (*Conopoderas atypha rava*), new. This island, also called Les Lanciers and Thrum Cap, is less than a mile in diameter. It has no lagoon, is wooded and is higher than the atolls.

On the 31 October the vessel reached Pinaki or Whitsunday Atoll, but no anchorage was found and my own boat was the only one that succeeded in making a landing through the dangerous waves that beat upon the reefs. This wonderful circular atoll, which has often been figured in works on geography, is a mile and a half in diameter, and is well forested, especially with cocoanut and Pandanus. There is a single shallow entrance to the enclosed shallow lagoon. The only birds obtained were a warbler (*Conopoderas atypha rava*) and a single sandpiper (*Aechmorhynchus parvirostris*), one other being seen. The latter species was not observed elsewhere and the only other specimens known are those obtained by Peale on islands of the Paumotu Group. Landings at Pinaki are difficult and the atoll is uninhabited. This was the last island of the Paumotus on which birds were collected.

Although I made a landing on Here-here-tue 3 November, no land birds were seen.

THE SOCIETY ISLANDS.— This group consists of ten principal islands and several small islets. They are high, rugged, and forested volcanic islands, usually with extensive coral reefs surrounding them. The barrier reefs often enclose large lagoons.

The first island reached was MEHETIA (Maitea, Osnaburg) where I landed for half an hour while the ship lay to, but found no land birds. Mehetia may be worth a careful examination by the ornithologist, as it is seven miles in diameter, 1,400 feet high, and is well forested. It is uninhabited. A specimen of *Sula leucogastra plotus* was obtained at this island.

TAHITI, formerly called Otaheiti, is the largest and most important of the Society Islands. It is in fact the largest in Eastern Polynesia, excepting of course the Hawaiian Islands which constitute an entirely separate group. Its greatest diameter is thirty-three miles and the highest peak has an elevation of 7,321 feet. The island is heavily forested, well watered, and has many fertile valleys which yield an abundance of the plant products of the tropics. There are numerous streams, many of which have at their heads waterfalls of great height. The population of Tahiti probably exceeds 10,000.

The ALBATROSS visited Tahiti twice, 27 September to 5 October, and again 6–15 November. The accumulated marine collections of the vessel were occupying so much space on board that it became necessary to pack and ship them from this point. This heavy task naturally interfered with the collecting of birds. Only six species of land birds were secured, fruit pigeon (*Ptilopus purpuratus*), kingfisher (*Todirhamphus veneratus*), swifts (*Collacalia ocista*, and *Collocalia thespesia*), weaver birds (*Lonchura castaneothorax*, and *Aegintha temporalis*), the last two being introduced. The native name for Todirhamphus is Ru-ru. No attempt was made to get water birds. Tahiti is poor in land birds, there being but few species besides those we obtained. One of these, the large pigeon (*Globicera aurorae*), we met with at Makatea in the Paumotus. The Polynesian duck (*Anas superciliosa*), was seen in the crater lake of Vaihiria, where a hawk, said to have been introduced, was also seen. The frigate bird, tropic bird, and White noddy were found high up among the mountains. The kingfisher, Todirhamphus, is common in the heavily wooded sections. So far as our examinations show, it feeds entirely on insects, although frequenting the vicinity of streams inhabited by small fishes.

The next anchorage after leaving Tahiti was at BORA BORA (Bola Bola) 17–18 November, where three species of birds were secured, Blue lory (*Choriphilus peruvianus*), kingfisher (*Todirhamphus tutus*), and the introduced weaver bird (*Lonchura castaneothorax*). A whole afternoon of diligent exploration failed to reveal any other species. The Blue lory, Choriphilus, is called Vè-ne, and the kingfisher, Todirhamphus, O-ta-tàri by the natives.

Bora Bora, like all of the Society Islands, is volcanic, surrounded with coral reefs. It is one of the most picturesque islands in Eastern Polynesia, with its range of craggy peaks, one of which rises to a height of 2,400 feet, and its encircling barrier reef dotted with cocoanut groves. It is heavily forested and has a population of about 600.

THE COOK OR HERVEY ISLANDS.—This group has nine rather widely separated islands, some of which are volcanic and rise to considerable heights. Others of less height are elevated coralliferous islands. All are forested and most of them are surrounded by barrier reefs, often enclosing lagoons.

The group has a native population of over 7,000. Six species of land birds have long been known, four of which are autochthonous.

Our stop of half a day at AITUTAKI, the only one visited, on 21 November, afforded little time for bird collecting. The only bird found was the Blue lory (*Choriphilus peruvianus*), of which I secured seven specimens. These were not different from those obtained at Rangiroa and Bora Bora. This common pet of the natives will probably be found on several other islands. Aitutaki has a length of four miles and a height of 450 feet. It is well wooded and watered and has a population of 1,500.

THE ISOLATED ISLAND OF NIUE. Niue or Savage Island, where we anchored for a few hours on 25 November, is an isolated coralliferous peak lying 600 miles west of Aitutaki and 250 miles east of the nearest part of the Tonga Group. Our soundings between Aitutaki and Niue revealed ocean depths exceeding 2,800 fathoms, and between Niue and the Tongas, depths exceeding 4,500 fathoms. It has a diameter of about ten miles, an elevation of 200 feet, and is well wooded. We saw trees perhaps sixty feet high. The island is fertile and has many breadfruit and mango trees. It has 4,000 inhabitants. The land birds secured were fruit pigeon (*Ptilopus porphyraceus*), parrot (*Vini australis*), cuckoo shrike (*Lalage whitmeei*), tree starling (*Aplonis brunnescens*), and a White-rumped swift (*Collocalia francica townsendi*), recently described by Oberholser from ALBATROSS collections as new. This species was also taken in the Tonga Islands. The genus is celebrated for the nest it builds against cliffs, from a secretion of its salivary glands, and which is marketed as "edible birds' nest."

It was observed at many points during the voyage. The cuckoo shrike (Lalage) and the tree starling (Aplonis) are both common at Niue.

This island probably has other land birds, as my brief search for birds was necessarily confined to the vicinity of Alofi village.

THE TONGA OR FRIENDLY ARCHIPELAGO consists of about 150 islands and islets, most of which are volcanic, others being of elevated coralliferous limestone. The group is over 400 miles in length. There are small volcanic islands extending along the western side for about 200 miles, some of which are occasionally active and for that reason are uninhabited. The three most active volcanoes, Tofua, Kao, and Late, rise to heights of 1,700 to 3,000 feet.

In the Tongas we found land birds more numerous than in any of the island groups previously visited.

EUA, (Middleburg), the most southerly of this group, was visited 28 November. During the afternoon in the vicinity of Ohonua village, I secured six species, fruit pigeon (*Ptilopus porphyraceus*), cuckoo shrike (*Lalage pacifica*), tree starling (*Aplonis tabuensis*), honey eater (*Meliphaga carunculata*), swift (*Collocalia francica townsendi*), previously found at Niue, and kingfisher (*Sauropatis sacra rabulata*), new. A few other species were observed, but there was no time to search farther inland. Eua Island is ten miles long, 1,000 feet high, and is well wooded.

Fruit pigeons (*Ptilopus porphyraceus*) are abundant in the Tongas. Numbers could be shot early in the morning, on the wing, as they approached the high "berry trees" on the fruit of which they feed habitually. In Niue and the Tongas pigeons in general are known by the name Kulu-kulu.

TONGATABU, (New Amsterdam of the older charts), visited 29 November to 1 December, is the largest of the Tongas, with a length of eighteen miles and an elevation at one part of 200 feet. It is a rather level island in general and is partly wooded. It lies about ten miles from Eua. Some of the birds taken here were of the same species as those from Eua: — *Lalage pacifica*, *Ptilopus porphyraceus*, and *Meliphaga carunculata*. Another pigeon, *Ptilopus perousii*, was added to our list. The kingfisher *Sauropatis sacra sacra* was different from that of Eua.

NOMUKA, (Annamooka), lying sixty miles north of Tongatabu, is only two miles in length and has on one side an elevation of 160 feet. It is wooded and has a small lagoon. Our stop for a short time on the afternoon of 2 December resulted in the following additions to the bird collection: — *Ptilopus porphyraceus*, *Sauropatis sacra sacra*, *Hypurolepis tahitica*, *Lalage pacifica*, *Aplonis tabuensis*, *Meliphaga carunculata*, wood shrike (*Pinarolestes heinei*), and Polynesian duck (*Anas superciliosus pelewensis*).

Vavau, the last island in the Tongas visited by the Expedition, is 100 miles north of Nomuka. It is nine miles in length and in one part about 700 feet high. It is cultivated, wooded, and has a population of over 3,000. The ship lay off Neiafu village 4 and 5 December. The name Neiafu should not be confused with Niuafou, the latter being an island about 200 miles north of Vavau. The birds of Niuafou were made known by Finsch in 1877. It was not visited by the Albatross. The birds taken at Vavau were *Ptilopus porphyraceus*, *Sauropatis sacra celada* (new), *Collocalia francica townsendi*, *Lalage pacifica*, a shrike (*Pachycephala jacquinoti*), and *Aplonis tabuensis*. Wild ducks were seen in the ponds. This island would probably repay careful ornithological exploration.

A single specimen of *Pluvialis dominicus fulvus* was taken at Vavau.

The Fiji Islands. This great archipelago contains about 150 islands and as many more islets and reefs. It extends through seven degrees of latitude and of longitude. The islands are of both volcanic and of coral formation, are densely forested, and have a native population of more than 100,000.

Kambara, where the Albatross lay from 7 to 9 December, is a wooded, volcanic island, four miles long, with a height of 470 feet.

Two of the birds found in the Tongas, *Ptilopus porphyraceus* and *Lalage pacifica*, were also found here. The other land birds were *Aplonis vitiensis*, honey eater (*Myzomela jugularis*), *Halcyon sacra vitiensis*, flycatcher (*Myiagra townsendi*), and wood shrike (*Pinarolestes nesiotes*), the last two being new species.

The honey eater, Myzomela, was the only species that appeared to be common near the village of Tokalau, where all the birds were obtained. Its native name is Bithi-bithi Kula. The new flycatcher, Myiagra, is called Sia-sia. Other birds might have been found in the higher woods, had there been time to search for them. There are apparently no records to show that Kambara had ever been visited by naturalists. There are perhaps a dozen islands in the Fiji Group, of the size of Kambara, about which naturalists have no information.

The Albatross arrived at Suva, Viti Levu Island, 10 December, and remained until the 19th. Viti Levu, largest of the Fijis, is also the largest island of Eastern or Central Polynesia, having an area of over 4,000 square miles. Its highest peak has an elevation of 5,000 feet. The rainfall is heavy and the largest river is navigable for small vessels for forty miles. It is heavily forested and the climate is that of the moist tropics. Parts of Viti Levu are well cultivated and the population is large.

Work pertaining to the fisheries and to ethnological collecting prevented systematic bird collecting in Viti Levu, but the following were secured: — *Lalage pacifica*, *Myzomela jugularis*, *Meliphaga procerior*, *Zosterops flaviceps*, *Acridotheres tristis*, and flycatcher (*Haplornis lessoni*).

The Mynah (*Acridotheres tristis*) is common. I did not ascertain when it was introduced. I found it abundant in the Hawaiian Islands twenty-five years ago. It is also common in Tahiti. Wherever introduced it becomes a menace to the native island species. The same may be said of the Mongoose now common on Viti Levu.

I was detached from the expedition at Suva and returned home by way of Samoa, the ALBATROSS proceeding northwestward through the Ellice, Gilbert, Marshall, Caroline, and Ladrone Islands to Japan.

THE SAMOAN ISLANDS. The birds picked up at Apia, UPOLU ISLAND, 26 December, were a parrot (*Vini australis*), kingfisher (*Todirhamphus recurvirostris*), honey eater (*Myzomela nigriventris*) and *Meliphaga carunculata*. The last is rather widely distributed, having been previously taken at several points in the Tongas.

Dr. H. F. Moore took up the work of bird collecting after I left the ALBATROSS in the Fijis. He found the bird life of the Caroline Islands richer and more varied than in any of the groups visited during the voyage: —

> "In the Ellice, Gilbert, and Marshall islands land birds are extremely uncommon and of but few species, the avifauna being poorer than in the Paumotus. The Society and Fiji Islands are progressively richer, but it was not until the Carolines were reached that the woods and thickets seemed full of birds and resounded with their songs and cries. Parrots and pigeons of several species, white-eyes, flycatchers, kingfishers, and many other species were observed at Kusaie, Ponape, and Truk, and the collections, which, in spite of effort, had languished for lack of material after leaving Suva, began to offer some returns to the shooters notwithstanding the brevity of the opportunities, which made it impossible to secure a really representative collection."

THE ELLICE ISLANDS, extending in a northwesterly direction for 360 miles, are low atolls, most of them with central lagoons. Funafuti, the only one from which birds were taken, is an atoll thirteen miles long. It was visited 23 December. The land birds were the large pigeon (*Globicera pacifica*), and a cuckoo (*Urodynamis taitensis taitensis*), said to lay its eggs in the nests of the noddy terns. These are the only land birds known to this group of islands. The water birds were *Pluvialis dominicus fulvus*, *Heteractitis incanus*, *Limosa lapponica baueri*, and the noddy (*Anous stolidus pileatus*).

The Gilbert Islands, having about the same extent as the Ellice Islands, are also atolls. Land birds were not obtained, but the following water birds were taken at Taritari (Butaritari) 6 January: *Arenaria interpres oahuensis*, *Phaeopus tahitiensis*, *Heteractitis incanus*, *Pluvialis dominicus fulvus*, and *Pisobia acuminata*.

The Marshall Islands. The Albatross cruised among the low atolls of the Marshall Islands from 9 January to 5 February. Land birds were not obtained. The water birds were the same species as those taken in the Gilberts with the exception of *Sterna sumatrana* from Arnho Atoll, 24 January. Two land birds are known to the Marshall Islands, *Urodynamis taitensis Globicera* and *oceanica*.

The Caroline Islands. The high volcanic islands of the Caroline Archipelago proved to be rich ground for bird collecting after a long cruise among the ornithologically barren atolls.

The Albatross was at Kusaie (Ualan, Strong) from 7 to 9 February. This is a volcanic island twenty-four miles in circumference and over 2,000 feet high. It is heavily forested and well watered. The land birds taken were *Ptilopus hernsheimi*, *Aplonis opaca*, *Myzomela rubratra rubratra*, *Zosterops cinerea*, and *Globicera oceanica oceanica*. The water birds were *Demigretta sacra*, *Heteractitis incanus* and *Anous stolidus pileatus*. About nine species of land birds were previously known to inhabit Kusaie.

Ponapé, or Ascension Island, was visited 11 and 12 February. It is a volcanic island which, with its surrounding coral reef, has a diameter of about seventeen miles. It has a height of nearly 3,000 feet, is heavily forested and well watered. The land birds taken were *Zosterops ponapenensis*, *Aplonis opaca*, *Myzomela rubratra dichromata* (new), *Conopoderas syrinx*, *Myiagra pluto*, *Rhipidura kubaryi*, *Sauropatis mediocris*, *Eos rubiginosa*, and *Globicera oceanica townsendi* (new). About eighteen species of land birds were known to Ponapé when reported upon by Finsch in 1880.

Uala, or Moen, is one of the small but lofty volcanic islands known as the Truk, Ruk or Hogelu Group all lying within a great lagoon. Truk is the largest atoll of the Carolines, the circumference of the lagoon enclosed by the outer barrier reef being 125 miles. Uala is 1,300 feet high and Ruk 1,000, while several of the others are nearly as high. All of the islands are wooded and have a total population of several thousands. The Albatross anchored at Uala 14–17 February, where the following birds were collected: — *Ptilopus ponapensis*, *Metabolus rugensis*, *Myiagra oceanica*, *Conopoderas syrinx*, *Zosterops semperi owstoni*, *Aplonis opaca*, and *Myzomela rubrata rubrata*. Water birds secured were *Nycticorax caledonicus*, *Ixobrychus sinensis moorei* (new), *Pluvialis dominicus fulvus*, *Arenaria interpres oahuensis*, and *Heteractitis brevipes*.

The adjacent islands of the lagoon were not visited. One of them. Ruk, had eleven species of land birds when reported upon in 1900.

The Ladrone Islands. Guam, visited 21 to 25 February, was the last island at which birds were collected during the cruise. This island is partly volcanic and partly elevated coralliferous limestone. It is twenty-two miles in length, forested, and has a height of 1,000 feet. The only land bird collected was the quail (*Excalfactoria chinensis lineata*) introduced from the Philippines. The water birds obtained were *Phaeopus phaeopus variegatus*, *Gallinula chloropus*, and *Ixobrychus sinensis bryani*. Twenty-seven species of land birds are known to the island of Guam. The expedition proceeded northward through the Ladrone or Mariana Islands, arriving at Yokohoma 4 March, 1900.

Part 2.— *Annotated List of the Species.* By Alexander Wetmore.

The collection of birds made during the cruise of the Albatross in Polynesia during the winter of 1899–1900 numbers 391 skins, fourteen alcoholic specimens, and one skeleton. These specimens represent ninety-three distinct forms, of which fourteen are here described for the first time.[1] Collections of birds were made on thirty-three islands some of which were little known and were visited by an ornithologist for the first time. The entire collection has considerable general interest, as a number of species were collected at their type-localities, and in several cases important series of such birds were secured. In working out this rich material I have been under deep obligation to Dr. C. W. Richmond, Associate Curator of Birds in the U. S. N. M., for advice and assistance in matters pertaining to bibliography and nomenclature. At one time Dr. Richmond had planned to publish on this collection personally but was prevented from carrying out his intention by press of other work. In completing the identification of these specimens he permitted the use of manuscript notes, made during his preliminary examination, that have proved of much value.

---

[1] Three new species of Collocalia collected during this cruise of the Albatross were described by Oberholser in 1906, see p. 200–201.

Much difficulty has been encountered in identifying the subspecific forms in many species discussed in the following pages through lack of sufficient material for comparison. These cases have been treated with as much care and attention as practicable, but in some instances it has been impossible to assign anything more than a specific name. In such comparisons the early collections of Titian R. Peale, made during the U. S. Exploring Expedition of 1838–1842, have been of great value. The importance of the birds in Peale's collections from an historical standpoint is not to be over-estimated, especially as a large part of the original type-specimens upon which Peale based his names of new species have been available for study. This collection was formerly mounted, but now all of the birds have been taken down and remade and are kept as study skins.

The treatment of the fruit pigeons of the genus Ptilopus in the present paper is highly unsatisfactory. The entire group of these pigeons is badly in need of revision, but in the present case this was impracticable because of a lack of sufficient material from many localities. Little attempt has been made here to accord the species any other treatment than that given them by Count Salvadori in the twenty first volume of the British Museum Catalogue of Birds, but it is believed that a number of new forms may be described eventually from the specimens listed herein. Additional collections from other islands are needed, however, before these may be diagnosed properly.

A series of 105 skins, forty-seven species or subspecies, from the specimens collected during the ALBATROSS expedition, has been placed in the M. C. Z. The remaining specimens, including the types of forms described here as new, are in the collections of the U. S. N. M.

In the following pages is given an annotated list of the species and subspecies identified, with descriptions of such forms as appear to be new. All measurements are given in millimeters.

PHAETHONTIDAE.

1. PHAËTHON RUBRICAUDUS Boddaert.

Phaëton rubricauda Boddaert, Tabl. plan. enl., 1783, p. 57. (Mauritius).

Three specimens were collected at sea about 600 miles east of the Marquesas Islands in Latitude 10° N., Longitude, 130° W., 2 September, 1899. All three are immature. One has the upper parts heavily barred with black, but in the other two these markings are less evident. The red-tailed tropic-birds without doubt are divisible into two or more subspecies, but in the absence of material from many localities needed for a competent review of the forms no attempt is made to allocate the present specimens subspecifically. The fact that all are immature would add to the difficulty of such an identification. The measurements of these birds are as follows: —

	No.	*Sex*	*Wing*	*Tail*	*Culmen*	*Tarsus*
	U. S. N. M. 212,164,	♀	313	232	63	28
	" 212,165,	♂	314	201	62	28.5
M. C. Z. 81,927 (	" 212,166)	♀	301	190	61	29.5

These skins are similar in size to specimens from Laysan Island, in the Hawaiian Group.

It has been proposed by Mathews (Austr. avian record, 1913, **2**, p. 56) to separate the Red-tailed tropic-bird from Phaëthon under the generic name Scaeophaethon, on the grounds that it has a longer wing, stronger legs and feet, and shorter tail. Upon careful comparison it is found that all of these characters do not hold. Thus when compared with *Phaëthon aethereus*, the type-species of the Linnaean genus Phaëthon, specimens of *P. rubricaudus* from Assumption and Gloriosa Islands (north of Madagascar) do have the wings longer. On the other hand red-tailed birds from Laysan Island have the wing equal to or shorter than that of the red-billed species. In other words birds from these two localities, representing only well-marked forms of one species, would be placed in different genera on this character. The feet and tarsi are slightly stronger and the tail is shorter in *rubricaudus* when series of the two species are compared. There is so much individual variation in respect to length of tail that it is of value only as an average character. In addition there are other structural characters separating the two that Mr. Mathews overlooked. From the series available it seems that Scaeophaethon has the operculum over the nostril broader and heavier, and barbs on the shafts of the two elongate rectrices on either side greatly reduced in length. This latter character is one by which Scaeophaethon may be recognized at a glance. The black line at the side of the black shaft in *P. rubricaudus* is misleading as it makes the shaft appear broad and strong while in reality it is the same size as the shaft in *P. aethereus*. When old and much worn the central rectrices of *P. aethereus* become narrowed and resemble those of Scaeophaethon but may be distinguished by their ragged appearance. As the small-billed *P. americanus* also has a strong broad operculum the basis of differentiation falls upon differences in the tail alone. These are assumed here to be only subgeneric in value and the Red-tailed tropic-bird is kept in Phaëthon.

SULIDAE.

2. SULA PISCATOR (Linné).

Pelecanus piscator Linné, Syst. nat., ed. 10, 1758, **1**, p. 134. (Java Seas).

Three specimens of this booby were collected at Tekokoto in the Paumotu Islands 26 October, 1899. None of these is in adult plumage though all are one year old or more. One specimen, a male, has the tail and head white, while the back and lesser wing coverts are hair-brown. In the two remaining specimens the tips of the rectrices are white and the rest of the plumage is dull.

Mathews (Birds of Australia, 1915, **4**, pt. 3, p. 216) states that specimens of this booby from the Pacific Ocean are larger in every dimension than those from the Atlantic region and that "the soft parts seem to differ." For this reason he separates the Australian bird under the subspecific name *rubripes* Gould. Concerning the color of the soft parts information of value is not available, but comparison of a series of skins from Pacific and Atlantic Ocean localities fails to substantiate the claim made as to difference in size. So far as measurements of wing, culmen, and tarsus go, specimens from the Paumotu Islands are almost identical with birds collected by the author on Desecheo Island, a small island lying between Porto Rico and Santo Domingo in the West Indies. Careful study of a larger series than that at hand will probably show that birds from the different ocean areas may be separated as subspecies, but for the present it is thought best to use the specific name for the birds in hand without attempt at subdivision. Especially this is the case since no Australian specimens are available for comparison.

The question of the separation of the Sulidae into genera is one that is subject to individual opinion more or less. There is no question that the three species of gannets form a well-characterized genus; but that there are trenchant lines separating the smaller species known as the boobies into groups that may be considered of generic rank, seems at present uncertain. The differences indicated rather signify only subgeneric differences. For the present it is proposed to ignore them and to include all of the smaller Sulidae in Sula, pending further study of available material that may throw light on the subject from another angle.

Recently Mathews (Birds of Australia, 1915, **4**, pt. 3, p. 212) has replaced *Pelecanus piscator* Linné, the name in common use for the Red-footed booby, by *Pelecanus sula* Linné, on the grounds that *Pelecanus piscator*, as used by Linné, was a name based upon a composite species, and that the form to which it properly belonged was indeterminate. The original name, however, must stand, as the following will show.

The name *Pelecanus piscator* appears in the tenth edition (1758) of Linné's Systema naturae on page 134. The description there is meager, and, as Mathews has shown part of the references there given are indeterminate, while a part belong properly to the bird known at the present time as *Sula leucogastra* (Boddaert). This, however, does not hold for all the citations noted. The first reference is, literally transcribed, "Chin. Lagerstr. 8." Mr. Mathews cites this but evidently did not have the work available, and so was forced to base his argument upon the second reference to "Osbeck iter, 85." The paper cited as "Chin. Lagerstr." is an inaugural dissertation entitled Chinensia Lagerströmiana by John L. Odhelius. From Dr. C. W. Richmond it is learned that this was printed first, as a separate publication of 36 pages, in 1754. Later in 1759 it was reprinted as number 4 in a collection of inaugural dissertations known as the Amoenitates academicae. A copy of this reprint is available and on reference it is found that species number 8 is given as "*Pelecanus (piscator)*." The pertinent portion of this reference is quoted here in full, as the tract in question is rare and not to be found save in large libraries: —

"S. Pelecanus (piscator) rostro serrato, cauda cuneiformi.
A. Anseri bassano affinis fusca avis. Sloane jam.
B. Anseri bassano congener cinereo-albus. Sloane jam.
præf. 31. t. 6. f. 1. Raj. aves 191.
Bubbi chinensibus.
Hujus duo adsunt sexus.
MAS (α) totus niger, abdomine canescente.
FEMINA (β) tota albida, remigibus nigris.
Rostrum utrisque gibbum, in fœmina præcipue sanguineum,
margine tenuissime retrorsum
serrato.
Gula nigra.
Corpus magnitudine anatis majoris.
Pedes sanguinei, magni, tetradactyli, digitis omnibus communi membrana junctis; unguis intermedii margo interior dilatatus & fere pectinatus.
Alæ utrius que sexus subtus albicant.
Rectrices caudae XIV, interioribus sensim longioribus, in fœmina etjam parum fuscescentibus."

There is little question that the male and female described above belong to separate species of which the female is the bird now known as *Sula piscator*.

Linné himself recognized that this name covered a mixture of two species, and in his twelfth edition of the Systema naturae (1766, p. 217) he again gives *Pelecanus piscator* with a slightly different diagnosis, and the reference "Amoen. acad. 4, p. 239. femina." This citation refers to the reprint published in 1759, on page 239 of which is found the description as quoted above. Linné as first reviser of the species has here restricted the name *Pelecanus piscator* to the female of the bird described by Odhelius, and there can be no doubt but that the Red-footed booby is intended. Mathews objects to Linné's statement that the flight feathers are black on the grounds that in the Red-footed booby the outer webs of the quills have a hoary gray appearance. This is true, but at the same time the body color of the feather is black, and to a casual inspection the entire feather appears blackish. The older naturalists were not so critical of color differences as are ornithologists today, so that we may overlook this slight error as the rest of the description tallies closely. Because of this statement that the wing feathers are black Mr. Mathews suggests that the bird described was *Sula abbotti* Ridgway, a species with intensely black flight feathers. This cannot be true, however, as Odhelius states that in his *Pelecanus piscator* there are fourteen rectrices while the type of *Sula abbotti* (the only specimen available) possesses sixteen. The name *Pelecanus piscator* Linné, therefore, is still available for the Red-footed booby.

3. Sula leucogastra plotus (Forster).

Pelecanus plotus Forster, Descrip. anim., 1844, p. 278. (Near New Caledonia).

An adult bird was taken on Tekokoto, Paumotu Islands, 26 October, and another was preserved as a skeleton from Mehetia, in the Society Islands during November, 1899. The skin from Tekokoto, with other birds examined from the Hawaiian Group and elsewhere in the Pacific, agrees with Mathews's description of the Australian form (Birds of Australia, 1915, **4**, pt. 3, p. 234) and differs from birds from the Atlantic region, in darker coloration above and in being slightly larger in size. No specimens have been examined from Australia in the present connection, but it is assumed that they are the same as the bird from the Paumotu Group. The difference in color between these birds, and those from localities in the Atlantic Ocean is well marked, and the races thus indicated seem to be well defined.

FREGATIDAE.

4. Fregata minor palmerstoni (Gmelin).

Pelecanus palmerstoni Gmelin, Syst. nat., 1789, **1**, pt. 2, p. 573. (Palmerston Island).

One specimen was taken, a female labeled "Polynesia." This bird has the throat and breast white, and the abdomen black. The culmen measures 117 mm., the wing 595 mm. A specimen in the U. S. N. M. from Kaui and two others from Laysan Island, in the Hawaiian Group, have the feathers of the "wing bar" with paler edgings than in this bird, and with a larger series it may be possible to recognize the form named *strumosa* by Hartert, as Mathews has done. In addition these three northern birds have a metallic sheen on the feathers of the back which is lacking in the specimen from Polynesia.

5. FREGATA ARIEL ARIEL (G. R. Gray).

Atagen ariel Gray, Gen. birds, 1845, **3**, plate 183. (Raine Island, North Australia).

One specimen, a male, was taken at Makemo, Paumotu Islands, 25 October, 1899. The culmen measures 86.5 mm. and the wing 495 mm. The gular pouch is not at all developed. ' There are so few specimens of this frigate-bird available that it is difficult to make out the forms into which it may properly be divided. The bird in hand is referred to the typical form.

ARDEIDAE.

6. DEMIGRETTA SACRA SACRA (Gmelin).

Ardea sacra Gmelin, Syst. nat., 1789, **1**, pt. 2, p. 640. (Tahiti).

Seven specimens were collected in the Paumotu Islands, the Gilbert Islands, and Kusaie in the Eastern Carolines. Two males from Makemo in the Paumotu Islands, were collected, 20 and 23 October, 1899, respectively. One is in fine dark plumage, while the other is white save for the elongate dorsal plumes. Of two birds collected at Rangiroa on 21 September, one sexed questionably as a female is also white with dark markings on the longer feathers of the back, while the other (a female) has the crown, sides of neck, breast, wings, and tail pied with dark markings, with white as the predominant color. Two males were taken at Tarawa, Gilbert Islands, 3 January, 1900; one is entirely white, while the other is pied as described in one bird from Rangiroa. A male from Kusaie, collected 8 February, 1900, has one dark feather among the right scapulars, but is white elsewhere. This specimen and the white bird from Tarawa are remarkable in having the elongate dorsal plumes white.

The status of the white and dark birds is somewhat uncertain, some ornithologists considering them to be distinct species. As dichromatism is so well known among other herons it is only reasonable to suppose, however, that these birds represent a similar case in the reef-herons. There are evident no structural characters by which light and dark birds may be separated, and color in this instance must be considered wholly unreliable, as is shown by the description given above of the specimens in hand. For the present these are referred to the typical subspecies.

7. Nycticorax caledonicus (Gmelin).

Ardea caledonica Gmelin, Syst. nat., 1789, **1**, pt. 2, p. 626. (New Caledonia).

An adult female was taken at Uala in the Middle Carolines, 16 February, 1900. This bird is seemingly in fully adult plumage but lacks the long white nuchal plumes found in this species when in full nuptial dress.

It is darker above than birds from New South Wales (*N. c. hilli* Mathews), Waigou, and New Guinea, and has the axillars and under wing coverts heavily washed with buff-pink, a character lacking in the few other specimens examined, though said to be found in some Australian birds. A dark purplish wash on the back is especially noticeable in this specimen when compared with others and the bill seems thick and heavy. The measurements of this bird are as follows: — wing 280 mm., tail 97 mm., tarsus 80 mm., exposed culmen 62 mm. The length of culmen is uncertain as the bill seems to have sustained some injury near the base of the culmen that has caused distorted feathers to come farther forward on the forehead than usual. On the right foot this specimen had lost all of the phalanges of the middle toe save the basal one and the nail from the second toe, leaving only well-healed stumps at the tips of these digits.

Apparently the Caroline Island bird represents a form characterized by dark coloration above, a pinkish wash on the under wing coverts, and a thick rather short bill. The short bill serves to separate it from *N. c. crassirostris* from the Bonin Islands, and the dark coloration from *N. c. hilli* Mathews from Australia. No material from New Caledonia, the type-locality of *caledonicus*, is available, so that I find myself unable to definitely name or differentiate the Caroline form.

The bill in the present specimen, as in all others that have been examined, has the basal portion of the mandible yellowish and the tip of the mandible and the maxilla black. It is said that *N. caledonicus* at times has the entire bill black as in *N. manillensis* Vigors, but I have seen none that exhibit this character. Mathews (Birds of Australia, 1914, **3**, pt. 6, p. 460) says, in his description of *N. c. hilli*, that the bill is black, and it is so figured in the plate that he gives of this night heron.

8. IXOBRYCHUS SINENSIS BRYANI (Seale).

Ardetta bryani Seale, Occas. papers Bernice Pauahi Bishop mus., 1900, **1**, no. 3, p. 27. (Guam).

An immature male of the Little yellow bittern was taken on Guam, 24 February, 1900. Comparison of a large series of these small bitterns in the U. S. N. M. from various localities (including adult birds taken on Guam) shows that the bird described by Seale as *Ardetta bryani* may be recognized as a valid form of the widespread *Ixobrychus sinensis*.

9. IXOBRYCHUS SINENSIS MOOREI, subsp. nov.

Characters.— Similar to *Ixobrychus sinensis bryani* (Seale) from Guam but back darker and duller in color, more grayish; distal portion of scapulars and tertials duller, and grayer; sides of head and neck much more pinkish, this color sharply defined from buff of throat, and not merging gradually into it; sides of neck much brighter, more pinkish brown.

Type.— U. S. N. M. 212,171. Adult male. Polynesia: Middle Caroline Islands; Truk Group, Uala, 16 February, 1900. H. F. Moore.

Description.— Feathers of crown dusky neutral gray, changing to deep neutral gray at sides and on elongate crest, a slight brownish wash evident anteriorly; feathers of hind neck cameo-brown, this color extending to shoulders; back bister, with a slight intermixture of snuff-brown; rump deep mouse-gray, shading into blackish mouse-gray at tips of upper tail coverts; elongate scapulars between snuff-brown and bister; tertials mouse-gray, the longer ones washed at the tips with snuff-brown; primaries black, the outer one margined indistinctly with paler, especially near tips, the others washed somewhat with neutral gray; outer secondaries black, washed lightly with neutral gray, inner ones snuff-brown; greater, middle, and lower lesser coverts between honey-yellow and isabella-color, with a slight wash of warm buff; shoulder and upper lesser coverts snuff-brown; large feathers of alula dusky neutral gray, the outer one margined broadly with light buff; anterior margin of wing white with a faint buffy tinge; sides of head and neck between mikado-brown and verona-brown, this color sharply differentiated from lighter color of throat and neck, somewhat less sharply demarked posteriorly; throat white with a very faint tinge of buff; foreneck pinkish buff, becoming nearly white toward upper breast; a dark patch on either side of upper breast, that is almost concealed by elongate feathers of neck, fuscous black above changing to deep mouse-gray below, the feathers all broadly margined with pinkish buff; rest of breast and sides dull cream-buff; abdomen and under tail coverts white, very faintly washed with buff; flanks honey-yellow; axillars and under wing coverts white, faintly tinged with buff; a small area of honey-yellow at bend of wing on under side. Distal half of culmen brownish black; rest of maxilla, except basal part of tomia, dull dark brown; base of mandibles, gonys, and maxillar tomia at base pale dull brownish buff; tip of mandible and sides dark dull brown; loral space dull brown; eye ring somewhat paler; tarsus and toes dark, dull brown, claws darker (from dried skin).

Measurements.— Male adult (*Type*) wing 128.5; tail 44; culmen from base 53.5; tarsus 45.2.

Range.— Island of Uala, Truk Group, Middle Caroline Islands, Polynesia.

Remarks.— This subspecies is based on a single specimen taken on the island of Uala. The differences noted in this one bird are not approached by individual variation in the large series of little yellow bitterns examined, so that there is no question but that the divergence shown is of subspecific value. In size the type of the new form characterized here is slightly larger than *Ixobrychus sinensis astrologus* Wetmore (Proc. Biol. soc. Washington, 1918, **31**, p. 83) recently described from the Philippine Islands, and, like *I. s. bryani* from Guam, it resembles the Philippine Island bird in color. It may be distinguished from *I. s. astrologus* by being darker, grayer, less rufescent on the back, by having the tertials and scapulars duller and less brownish, the under tail coverts whiter, and the sides of head and neck brighter brown, more sharply defined from the color of the median line.

From the material at hand it is possible now to recognize the following races of the little yellow bittern: —

IXOBRYCHUS SINENSIS SINENSIS (Gmelin) (*Ardea sinensis* Gmelin, Syst. nat., 1789, **1**, pt. 2, p. 642. China). China (Tientsin, Hankow, Tung Chow, near Hongkong).

IXOBRYCHUS SINENSIS LUTEOLUS (Stejneger) (*Ardetta luteola* Stejneger, Proc. U. S. N. M., 1888, **10**, p. 289. Wakayama, Kii, Hondo) Japan (Islands of Yezo, Nippon, and Hondo).

IXOBRYCHUS SINENSIS LEPIDUS (Horsfield) (*Ardea lepida* Horsfield, Trans. Linn. soc. London, 1821, **13**, p. 190. Java). Java (Sumatra?).

Ixobrychus sinensis astrologus Wetmore (Proc. Biol. soc. Washington, 1918, **31**, p. 83. Luzon). Philippine Islands.

Ixobrychus sinensis bryani (Seale) (*Ardetta bryani* Seale, Occas. papers Bernice Pauahi Bishop mus., 1901, **1**, no. 3, p. 27 Guam). Guam, Marianne Islands.

Ixobrychus sinensis moorei Wetmore, *Supra*, p. 173, Uala, Middle Caroline Islands.

In the series examined other localities than those listed above are represented only by birds in immature plumage whose subspecific identification is somewhat uncertain until additional material is available. There are without question several other races present, so that the forms listed are given merely to render the treatment accorded the Caroline Island bird intelligible. It may be noted that another name is available for a form of this bittern as the bird from the Andaman Islands has been described by Hume (Stray feathers, 1873, **1**, p. 309) as (*Ardetta*) *pulchra*, but no specimens from that locality have been available in the present study.

ANATIDAE.

10. Anas superciliosa pelewensis Hartlaub and Finsch.

Anas superciliosa Gmel. var. *pelewensis* Hartlaub and Finsch, Proc. Zool. soc. London, 1872, p. 108. (Pelew Islands).

Two specimens were taken, in the Tonga Islands, a male at Nomuka, 2 December, 1899, and an adult bird with sex not marked, at Vavau, 5 December, 1899. The type-locality of *Anas superciliosa* Gmelin is New Zealand and the bird from Australia which is distinctly larger than the typical form has been separated by Mathews (Austr. avian record, 1912, **1**, p. 33) as *A. s. rogersi*. Polynesian birds (from Upolu, Samoan Islands, Nomuka, and Vavau, Tonga Islands, and Tahiti) are similar in size to the New Zealand form, but differ from both *A. s. superciliosa* and *A. s. rogersi* in being distinctly darker below and in having the throat, band on side of head, and superciliary stripe pinkish buff. In *superciliosa* proper and in *rogersi* the buff on these areas is decidedly less rufescent. Measurements of the two specimens in the present collection are as follows: —

No.	*Sex*	*Locality*	*Wing*	*Tail*	*Culmen*	*Tarsus*
U. S. N. M. 212,167	♂	Nomuka, Tonga Islands	217.5	75.2	48.0	43.0
" 212,168	?	Vavau, " "	240.0	——	42.6	44.5

These are placed with some reserve under *pelewensis*, (no specimens of which are available) as in general they agree with the original description of that form.

PHASIANIDAE.

11. GALLUS GALLUS (Linné).

Phasianus gallus Linné, Syst. nat., ed. 10, 1758, **1**, p. 158. (India orientali).

An adult male in full plumage was collected on Nukuhiva in the Marquesas Islands, 16 September. This bird is somewhat larger than birds from Siam and elsewhere in the proper range of *G. gallus*, and has larger feet and heavier tarsi than in the average specimen from other localities. Peale (U. S. explor. exped., 1848, **8**, p. 179) found the Jungle Fowl wild on the island of Tahiti, and collected several specimens. He called attention to the fact that his birds were "a shade lighter in colour, somewhat larger, with broader pendant feathers in the tail, and larger comb which is entire on the hind part," and gave figures illustrating the heads of birds from Tahiti and Malacca. Dr. Richmond has called my attention to the fact that Hartlaub (Journ. für ornith., 1854, p. 169) named this bird of Peale's *Gallus tahitiensis*, basing the name on Peale's figure and description. This name, changed to *Gallus tahiticus*, was used by Cassin (U. S. explor. exped., 1858, **8**, p. 290) who remarks that "In the collection of the expedition we find a well-characterized specimen from Tahiti." From Dr. Richmond it is learned that Baird was unable to find this bird when making a manuscript list of the birds in the Smithsonian Museum, between 1860 and 1865, as he wrote "not found" at the top of the sheet devoted to this specimen.

The specimen examined from Nukuhiva has the back of the comb entire, but this seems to be a character of little weight as wild birds from elsewhere agree with it in this point; it has the following measurements: — wing 236; tail 206; culmen (from comb) 18.2; tarsus 89.3; middle toe with claw 68.5.

PERDICIDAE.

12. EXCALFACTORIA CHINENSIS LINEATA (Scopoli).

Oriolus lineatus Scopoli, Deliciae florae et faunae Insubricae, 1786, pt. 2, p. 87. (Luzon).

A male was collected at Guam, 24 February, 1900. Seale (Occas.

papers Bernice Pauahi Bishop mus., 1901, **1**, no. 3, p. 37) states that this quail was introduced into Guam from Manila in 1894 by Captain Pedro Duarty of the Spanish Army.

RALLIDAE.

13. Gallinula chloropus (Linné).

Fulica chloropus Linné, Syst. nat., ed. 10, 1758, **1**, p. 152. (England).[1]

An adult female was collected at Guam, 24 February, 1900. This bird has the following measurements: —

No.	*Wing*	*Tail*	*Tarsus*
U. S. N. M. 212,180	158.0	62.5	48.0

The material at hand representing this species from localities outside the United States is too scanty to permit satisfactory study of subspecies at present, so that this specimen is simply catalogued as above without attempt to show its subspecific relationships.

CHARADRIIDAE.

14. Pluvialis dominicus fulvus (Gmelin).

Charadrius fulvus Gmelin, Syst. nat., 1789, **1**. pt. 2, p. 687. (Tahiti).

Eighteen specimens of the Eastern or Pacific golden plover were secured from the following localities:— Makatea, 6 October; Tikei, 9 October; Makemo, 20 October, (Paumotu Islands); Vavau, (Tonga Islands) 4 December; and Arhno Atoll, 25 January (Marshall Islands); Tarawa, 3 January; Funafuti (Ellice Islands) 24 December; Rongelab, 18 January, and Taritari, 6 January (Gilbert Islands); and Uala (Middle Carolines) 16 February. A female from Tikei has many black feathers on the under surface. A male from Makemo is less strongly marked with black. Others are all in full winter plumage.

ARENARIIDAE.

15. Arenaria interpres oahuensis (Bloxam).

Tringa oahuensis Bloxam, Byron's Voy. Blonde to the Sandwich Islands, 1826, p. 251. (Sandwich Islands).

Eleven specimens obtained were collected as follows: — One female and one specimen without sex, Funafuti, Ellice Islands, 24 December, 1899; two males and one female, Tarawa, Gilbert Islands, 3 January, 1900; a male and a female, Taritari, Gilbert Islands, 6 January, 1900; a male, Jaluit, Marshall Islands, 10 January, a male and an unsexed specimen, Rongelab, Marshall Islands, 18 January, and a female at Uala in the Middle Carolines on 16 February. All of these birds are in full winter plumage. Comparison of a small series of European birds shows that the Pacific turnstone when in breeding plumage differs in having the chestnut areas of the back slightly darker.

---

[1] Hartert, Nov. zool., 1902, **9**, p. 424.

SCOLOPACIDAE.

16. Phaeopus phaeopus variegatus (Scopoli).

Tantalus variegatus Scopoli, Deliciae florae et faunae Insubricae, 1786, pt. 2, p. 92. (Luzon).

A male was collected at Guam in the Ladrone Islands, 24 February, 1900.

Mathews (Birds of Australia, 1913, **3**, pt. 2, p. 168–169, 175) states that the species included in Phaeopus differ from the three species allotted to true Numenius (*N. arquata, cyanopus,* and *americanus*) in having the bill shorter than one half the wing, shorter than the tail, shorter than the tarsus and middle toe together, the tail longer than the tarsus and middle toe, and the middle toe more than half the tarsus. Careful comparison of all of the species involved shows that Numenius differs structurally from Phaeopus only in having the bill longer than the tarsus with middle toe, and longer than the tail. In Phaeopus the bill is shorter than the tarsus with the middle toe, and equal to or shorter than the tail. Though in most Numenius the bill is longer than half the wing, in some of the adult specimens of all three species included here the bill is less than one half the wing, as it is in all the forms belonging under Phaeopus. Though the tail is shorter than the tarsus with middle toe in all three species referred to Numenius, it is also shorter in *Phaeopus tahitiensis*, though longer in all the other species of Phaeopus. The length of the middle toe compared with the length of tarsus is found to be more in Phaeopus but variable in Numenius, so that it has no value as a generic character. The valid structural differences between the two genera may be summed up as follows:—

a. Bill longer than tarsus with middle toe, longer than tail. *Numenius.*

aa. Bill shorter than tarsus with middle toe, equal to or shorter than tail . . . . *Phaeopus.*

The species of Numenius are larger than those of Phaeopus, but there is no pronounced gap between the two groups, as *P. tahitiensis* and *P. hudsonicus* form intermediate steps between the larger and smaller curlews.

17. PHAEOPUS TAHITIENSIS (Gmelin).

Scolopax tahitiensis Gmelin, Syst. nat., 1789, **1**, pt. 2, p. 656. (Tahiti).

Ten specimens of this fine curlew were collected as follows:— Makatea, 6 October, and Makemo, 22 October, Paumotu Islands; Taritari, Gilbert Islands, 6 January; and Rongelab, Marshall Islands, 18 January. Two males and two females were taken at both of the last two localities. Two birds from the Paumotus are in rather worn plumage. January specimens from Taritari and Rongelab have molted and are in fresh plumage save for one bird (a female) from Rongelab. In it the wings and tail show much wear. One male from the same locality has a strong wash of rufous on the neck and upper breast. In one male and one female from Taritari the dark markings of the throat and upper breast are nearly obsolete.

18. HETERACTITIS INCANUS (Gmelin).

Scolopax incanus Gmelin, Syst. nat., 1789, **1**, pt. 2, p. 658. (Eimeo and Palmerston Islands).

Nine specimens in the collection were taken at Nukuhiva, Marquesas Islands, 16 September; Rangiroa, 21 September, and Makemo, 20 October, Paumotu Islands; Funafuti, Ellice Islands, 24 December; Tarawa, 3 January, and Taritari, 6 January, Gilbert Islands; and Kusaie, Eastern Carolines, 9 February. A female taken at Rangiroa, Paumotu Islands, 21 September, still retains a part of the barred adult plumage on the under parts. The other specimens are in winter plumage. This species seems to range in winter across most of Polynesia and the bird secured at Kusaie marks a point near its westward limit. In the present collection it was replaced at Uala by the allied *H. brevipes.*

19. HETERACTITIS BREVIPES (Vieillot).

Totanus brevipes Vieillot, Nov. dict. hist. nat., 1816, **6**, p. 410. (Timor).

One male was taken at Uala in the Middle Carolines, 16 February, 1900. Mathews (Birds of Australia, 1913, **3**, pt. 3, p. 209) considers *Heteractitis brevipes* a form of *H. incanus*, but the differences characterizing it seem so constant as to establish it as a full species. Examination of a considerable series of tattlers in the U. S. N. M. collection reveals no intergradation and all specimens examined could be determined as either *H. incanus* or *H. brevipes* at a glance. The differences between the two have been well set forth by Dr. Stejneger (Bull. 29 U. S. N. M., 1885, p. 132).

20. LIMOSA LAPPONICA BAUERI (Naumann).

Limosa baueri Naumann, Vögel Deutschl., 1836, **8**, p. 429. (Australia).

A female collected on Funafuti 24 December, 1899, constitutes, apparently, the first record of the bird in the Ellice Islands. Mathews (Birds of Australia, 1913, **3**, pt. 2, p. 191) has divided the genus Limosa, as at present recognized, into two groups, proposing the name Vetola for *Limosa lapponica*, a genus which, if recognized, must also include *Limosa haemastica* and *L. fedoa.* He restricts Limosa to the single species *Limosa limosa.* and in his diagnosis gives the following as distinguishing Vetola from it: "the bill is proportionately shorter and more slender and distinctly more upturned; the groove on the upper mandible becomes obsolete at about three-quarters the length of the culmen owing to the strong vertical compression of the upper mandible, the groove on the lower mandible persists however as in *Limosa.* The legs are short, the exposed tibia being less than the length of the middle toe, the metatarsus is less than twice the middle toe and also less than one-third the length of the wing, the scutellation of the front of the metatarsus becomes irregular and broken up into hexagonal scales towards the tibio-tarsal joint, whereas in Limosa the scutellation is quite regular. The middle claw is normal, untoothed and short, being one-fourth, or less, the length of the middle toe."

Examination of a series of specimens of the four species of godwits included under the genus Limosa (*sensu latu*) fails to substantiate the validity of all of the differences outlined by Mr. Mathews, which apparently are based only on *Limosa limosa* and *L. lapponica*. His alleged differences will be taken up and considered in turn as he has given them. The bill in the species *limosa* is longer than in *haemastica* and *lapponica*, but shorter than in *fedoa*. In *limosa* the bill is more slender and less robust than it is in *fedoa*, while it is nearly straight in *limosa*, slightly upturned at the tip in *lapponica*, *haemastica*, and *fedoa*. The groove on the upper mandible varies slightly in length in all four species, but shows no specific differences in its development. With regard to the legs *limosa* has the lower extremities relatively slightly longer and somewhat more slender than in the other three species under discussion. The tarsus in *fedoa* is as long as it is in *limosa*, but the leg in the former is heavier and more bulky, and when compared with the wing is relatively slightly shorter than it is in *limosa*. The length of the crus when compared with the middle toe without the claw may be more or less as it varies individually. The measurement of the tarsus compared with that of the middle toe is also a variable factor, and may be more or less than twice the middle toe without the claw, depending upon the condition of the individual specimen. The length of the tarsus varies also when compared with the length of the wing according to the specimen in hand, and may equal more or less than one third of the wing, irrespective of species.

The scutellation of the front of the tarsus shows no constant difference in the four species under consideration. In general the scutes are transverse on the lower tarsus, and divided or broken toward the tibia.

The distance that the broken scutes extend down the front of the tarsus varies individually in all the species, and in addition there is a tendency for single scutes on the front of the tarsus below the area to become broken or divided. The development of the claw of the middle toe is also a variable character in spite of what has been said to the contrary. It is usually more slender in *limosa* than in the others, and seems always to be slightly more elongate in that species; but may be produced also and even pectinated in *haemastica* and *fedoa*, while the outer margin is often thin and distinctly crenulated in *lapponica*, with pectinate divisions indicated in some specimens.

To sum up the discussion as given above the valid differences between these proposed genera are apparently as follows: —

a. Legs relatively slightly longer, more slender; toes relatively slightly more slender; bill nearly straight, not distinctly upturned at distal end, somewhat flattened near tip. . . . . *Limosa*.

aa. Legs relatively slightly shorter, somewhat heavier; toes relatively slightly stronger; bill slightly upturned at distal end, decidedly flattened for distal third (sometimes for slightly more). *Vetola.*

After careful consideration and reëxamination of a series of the four species these distinctions appear to be too slight and too inconstant to merit recognition as of generic value. The genus Limosa is used therefore in the present connection as the proper one for *Limosa lapponica baueri.*

21. PISOBIA ACUMINATA (Horsfield).

Totanus acuminatus Horsfield, Trans. Linn. soc. London, 1821, **13**, p. 192. (Java).

Three specimens were secured at Taritari in the Gilbert Islands on 6 January, 1900. The species does not appear to have been recorded previously from this group.

22. AECHMORHYNCHUS PARVIROSTRIS (Peale).

Tringa parvirostris Peale, U. S. explor. exped., 1848, **8**, p. 235. (Dog or Honden, and Raraka Islands, Paumotu Group).

An adult female was shot on Whitsunday Atoll, Paumotu Islands, 31 October, 1899. *Tringa parvirostris* of Peale has been referred to *Tringa cancellata* Gmelin (Syst. nat., 1789, **1**, pt. 2, p. 675) which is based on the Barred phalarope of Latham. In Latham's original description (Gen. syn. birds, 1785, **3**, pt. 1, p. 274) it is stated that the bird described was in the collection of Sir Joseph Banks and that it had come from Christmas Island. Latham remarks that the bill was one inch long and that the under parts were white barred with dusky. There are in the U. S. N. M. three of the five specimens collected by Peale on Dog (or Honden) and Raraka Islands. On examining these and the bird secured on Whitsunday Atoll it is found that in the largest the bill is only 18 mm. long, and that in all the throat and abdomen are plain and unmarked. The birds secured by Peale are much stained and discolored, but in the fresh specimen taken by Dr. Townsend the under parts have a distinct buffy tinge. It appears, therefore, that Latham's Barred phalarope should be referred to some other species than the present one. Dr. T. H. Streets, U. S. N., who made a collection of birds on Christmas Island in the Fanning Group in 1874 (Bull. 7 U. S. N. M., 1877) did not record *Aechmorhynchus parvirostris*, and Christmas Island is two thousand miles from the nearest point at which that species is known at present.

The female shot on Whitsunday Atoll is distinctly larger than the specimens collected by Peale. The bill is longer, and the toes are noticeable for their length. As Peale's specimens are more or less stained and yellowed there can be no direct comparison in color and as none of his specimens have the sex indicated on the labels it is probable that these differences in size may be merely sexual characters.

It is possible that *Aechmorhynchus parvirostris* is an ancient species now on the verge of extinction. The bird collected on Whitsunday Atoll has three white edgings on the scapulars of the left side, and one of Peale's specimens (U. S. N. M. 15,721) possesses an extra digit with two phalanges and a small claw, growing from the base of the second phalanx of the fourth toe on the left foot. These abnormalities may mark degeneration due to inbreeding, or declining virility in the stock.

LARIDAE.

23. ANOÜS STOLIDUS PILEATUS (Scopoli).

Sterna pileata Scopoli, Deliciae florae et faunae Insubricae, 1786, pt. 2, p. 92. (Philippines).

Four specimens, all adult males, were collected as follows: — Kusaie, Eastern Caroline Islands, one, 8 February, 1900; Funafuti, Ellice Islands, one, 24 December, 1899; Makemo, 22 October, 1899, and Makatea, 6 October, 1899, both in the Paumotu Islands. Mathews (Birds of Australia, 1912, **2**, pt. 4, p. 411) assigns the name *Anoüs s. unicolor* (Nordmann) to birds from the Society and Paumotu Islands "and other South Pacific groups." He remarks only that this proposed form is larger than any of the others. As it is found that birds from the Straits of Malacca and the China Sea are fully as large, this name is rejected and the specimens are placed under *A. s. pileatus* (Scopoli). It may be remarked also that specimens of *A. s. galapagensis* Sharpe, a form distinguished by its darker coloration, have the wing as long as birds from the Paumotu Islands. Measurements of the specimens in the present collection are as follows: —

No.	*Sex*	*Locality*		*Wing*	*Tail*	*Culmen*	*Tarsus*
U. S. N. M. 212,148	♂	Kusaie, Eastern Carolines	8 Feb., 1900	277.0	158.2	42.0	26.0
" 212,147	♂	Funafuti, Ellice Islands	24 Dec., 1899	267.0	153.0	40.0	23.0
" 212,146	♂	Makemo, Paumotu Islands	22 Oct., 1899	284.0	170.0	41.5	25.0
" 212,145	♂	Makatea, Paumotu Islands	8 Oct., 1899	285.0	166.0	43.0	24.0

24. MEGALOPTERUS MELANOGENYS (G. R. Gray).

Anous melanogenys Gray, Gen. birds, 1846, **3**, p. 658, pl. 182. (No type-locality assigned).

Three specimens come from the Paumotu Islands, a male taken at Rangiroa, 21 September, 1899, a female at Makemo, 22 October, 1899, and a third specimen that bears neither locality nor date. These birds are all fully adult. From lack of sufficient material for comparison it is not practicable at present to designate to what subspecies the birds from the Low Archipelago belong. Mathews (Nov. zool., 1911, **18**, p. 4) finds that Megalopterus Boie (Isis, 1826, p. 980) preoccupies Micranous Saunders (Bull. 23 Brit. ornith. club, 1895, p. 19). Mathews (Birds of Australia, 1912, **2**, pt. 4, p. 420) states further that the name *Anous minutus* Boie (Isis, 1844, p. 188) "is applicable to this species only, the bill characters being diagnostic." As Boie, in describing the bill, remarks simply "Schnabel und Füsse schwarz, ersterer sehr schwach," his statement might apply to either the present species or to *M. tenuirostris*. As the name cannot be fixed it must be abandoned. The next available name is *Anous melanogenys* G. R. Gray (Gen. birds, Jany., 1846, **3**, p. 658). This preoccupies the name *Anous leucocapillus* Gould (Proc. Zool. soc. London, 1845, [Feby., 1846], p. 103) as this designation although in the volume of the Proceedings of the Zoological Society for 1845 was not actually published until February, 1846. The species therefore will stand as *Megalopterus melanogenys*.

25. PROCELSTERNA CERULEA (F. D. Bennett).

Sterna cerulea Bennett, Narrative whaling voyage, 1840, **2**, p. 248. ("Christmas Island and other low coral formations of the Pacific").

One specimen was taken, an adult female from Rangiroa, Paumotu

Islands, collected 22 September, 1899. From lack of material for comparison it is not possible to assign a subspecific name to this bird. According to Mathews (Birds of Australia, 1912, **2**, pt. 4, p. 431), specimens from the Paumotu, Marquesas, and Society Islands should be called *Procelsterna cerulea teretirostris* (Lafresnaye).

26. GYGIS ALBA PACIFICA (Lesson).

Sterna pacifica Lesson, Ann. sci. nat., 1825, **4**, p. 101. (Society Islands, Paumotu Islands, and Bora Bora).

Three specimens were taken, a female at Tekokoto, 26 October, 1899, and two males at Akiaki, Paumotu Islands, 30 October, 1899. Measurements of the specimens follow: —

No.	*Sex*	*Locality*		*Wing*	*Tail*	*Culmen*	*Tarsus*
M. C. Z. 81,929 (U. S. N. M. 212,152)	♂	Akiaki, Paumotu Islands	30 Oct., 1899	249.0	124.0	40.2	13.8
" 212,153	♂	Akiaki, Paumotu Islands	30 Oct., 1899	243.0	127.5	41.0	13.0
" 212,154	♀	Tekokoto, Paumotu Islands	26 Oct., 1899	243.0	117.0	40.0	13.5

27. GYGIS MICRORHYNCHA Saunders.

Gygis microrhyncha Saunders, Proc. Zool. soc. London, 1876, p. 668. (Marquesas Group).

Four specimens were collected of which three, a male, a female, and an alcoholic specimen whose sex is not known at present were taken at Nukuhiva, Marquesas Islands, on 16 September, 1899. The fourth is a mummy that probably should bear the same date. These birds differ from the original description in having the shafts of the rectrices blackish (not entirely white). In addition the second rectrix is the longest instead of the third as is stated by Saunders. The black eye ring is more distinct than in specimens of *Gygis alba*.

28. STERNA LUNATA Peale.

Sterna lunata Peale, U. S. explor. Exped., 1848, **8**, p. 277. (Vincennes Island, Paumotu Group).

One specimen, an immature bird, was collected at Rangiroa, Paumotu Islands, 23 September, 1899.

29. STERNA SUMATRANA Raffles.

Sterna sumatrana Raffles, Trans. Linn. soc. London, 1821, **13**, p. 329. (Sumatra).

One specimen, a young bird not yet grown, in juvenal plumage was taken at Arhno Atoll in the Marshall Islands, 26 January, 1900. Mathews (Birds of Australia, 1912, **2**, pt. 4, p. 372) gives two forms under this species but seems uncertain as to the status of birds from Polynesia as he says "birds from Fiji, Pelew Islands, and Phoenix Island do not seem easily referable to the North-east Australian form." The latter he has described as *Sterna sumatrana kempi* (Nov. zool., 1912, **18**, p. 210) with Torres Strait as the type-locality. The specimen in hand is too immature to permit satisfactory comparison.

30. THALASSEUS BERGII RECTRIROSTRIS (Peale).

Sterna rectrirostris Peale, U. S. explor. exped., 1848, **8**, p. 281, pl. 75, fig. 2. (Feejee Islands).

Three specimens were taken at Makemo in the Paumotu Islands, a female 22 October, and two males 23 October, 1899. These birds are typical of this subspecies and differ from *T. b. pelecanoides* (King) in being slightly paler above. The differences noted are slight but seem strong enough to uphold the separation of this form.

TRERONIDAE.

31. PTILOPUS CORALENSIS (Peale).

Ptilinopus coralensis Peale, U. S. explor. exped., 1848, **8**, p. 190. (Carlshoff or Aratica Island).

There are fourteen specimens of this fruit pigeon in the collection taken in the Paumotu Islands at the following localities:— Makemo, 20 October; Niau, 7 October; Fakarava, 11 October and Makatea, 26 September and 6 October. The type of this species came from Carlshoff or Aratica Island, and the specimens listed above give the first definite records known for other islands, though Peale remarks that the species was found on many of the low coral islets of the

Paumotu Group. The birds from Makatea have the light edgings of the secondaries paler than specimens from Niau, Fakarava, and Makemo, but are otherwise the same. The type-specimen of *Ptilinopus coralensis* Peale was redescribed by Salvadori (Cat. birds Brit. mus., 1893, **21**, p. 105) as *Ptilopus smithsonianus*, as he found that it did not agree in color with the plate as given by Peale. Peale's type was a mounted bird originally, though now remade as a skin, and the differences noted by Salvadori seem due to long exposure to dust and light. *Ptilopus smithsonianus* will stand as a direct synonym of *P. coralensis* with the same type-specimen extant for both (see Ogilvie-Grant, Ibis, 1913, p. 349).

32. Ptilopus perousii (Peale).

Ptilinopus perousii Peale, U. S. explor. exped., 1848, **8**, p. 195. (Upolu, Samoan Islands).

Five specimens of this handsome pigeon were collected at Tongatabu in the Tonga Islands on 30 November. One other has the locality uncertain but probably came from this same island. Three males in a series of four have an ochraceous orange band across the breast, while in the fourth this band is barely indicated. One female has the shorter under tail coverts tipped with red and their bases and the longer feathers yellow. Another (place of capture somewhat uncertain) has the under tail coverts entirely yellow.

33. Ptilopus dupetithouarsii (Neboux).

Columbia dupetithousarsii Neboux, Rev. zool., 1840, p. 289. (Christina Island, Marquesas Group).

Eight specimens, six of them males, were taken at Nukuhiva, Marquesas Islands, on 16 September. The males vary in the amount of reddish orange on the underparts. One adult female resembles the males but has less of this bright color below than the more highly colored specimens. An immature female has the reddish orange patch below as in adults while the crown cap is grayer and much obscured posteriorly by greenish tips on the feathers. The bill in this species is dusky, the feet brownish.

34. PTILOPUS PORPHYRACEUS (Temminck).

Columba porphyracea Temminck, Trans. Linn. soc., London, 1821, **13**, p. 130. (Tongatabu and Ulieta).

Eleven specimens were collected at the following localities:— Niue, 25 November; Eua, 28 November; Tongatabu, 30 November; Nomuka, 2 December; and Vavau, 4 December, all in the Tonga Islands; and Kambara, 7 December in the Fiji Islands. The species does not seem to have been recorded from Kambara and Nomuka before. The bird from the Fijis has been called *Ptilopus porphyraceus clementinae* (Jacquinot and Pucheran) (Wiglesworth, Aves Polynesiae, 1891, p. 50). It is slightly paler on the breast and throat than the average in the series but in this respect is equalled by one bird from Eua. The under tail coverts are yellower also but other specimens from the Tonga Islands resemble it closely. A bird in immature plumage from Eua has the under tail coverts entirely yellow with no orange at all, so that the depth and extent of the orange color in these feathers seems to be dependent upon age. No females are represented in the collection so that no comparison is possible between the two sexes in regard to this character. It is worthy of note that two males, apparently adult, from Niue have the under tail coverts entirely deep yellow.

In an immature bird from Eua the aster-purple crown of the adult is indicated on the forehead by a few new feathers at the base of the cere. Elsewhere the crown is green (between light hellebore and light elm-green) like the back. All of the wing coverts, tertials, and scapulars are tipped with yellow. The primaries are tipped with white, the secondaries with white and margined with yellowish, and there are obscure yellow tips on the feathers of the back forming slender cross-bars. The terminal tail band is obsolete on the median pair of rectrices. The under tail coverts, abdomen, and a patch either side of the rump are yellow, there is an obscure yellowish patch on the middle of the abdomen and the feathers of the lower throat and breast are tipped with yellow. There is no trace of a dark band on the lower breast, and the concealed blue spots found in the adult near the tips of tertials and scapulars are faintly indicated on some feathers in these areas by obscure spots of slightly brighter green.

35. Ptilopus purpuratus (Gmelin).

Columba purpurata Gmelin, Syst. nat., 1789, **1**, pt. 2, p. 784. (In insulis australis intra tropicos inclusis).

One specimen was collected at Tahiti in the Society Islands on 13 November, and two more were secured the following day. One of these birds has a strong coppery reflection on the rectrices as in *P. coralensis*. This color is arranged in narrow bands. The feet in all three specimens are blackish.

36. Ptilopus hernsheimi Finsch.

Ptilopus hernsheimi Finsch, Journ. für ornith., 1880, p. 303. (Kusaie, Eastern Carolines).

A male, a female, two immature birds, and two mummies (formerly preserved as alcoholic specimens) are in the collection from Kusaie, 8 and 9 February. In color the female is similar to the male save that there is less of deep orange color on the longer under tail coverts. The other sexual color differences indicated by Dr. Finsch in his original description are not evident. The two immature birds differ from the adults in having the crown-cap barely indicated on the forehead. In addition the feathers of back, rump, wing coverts, and under parts are tipped lightly with pale yellow, the secondaries are tipped with yellowish white, the primaries are pointed with white and the terminal band on the rectrices is much narrower.

Measurements of the birds with sex indicated are as follows:—

No.	*Sex*	*Wing*	*Tail*	*Exposed Culmen*	*Tarsus*
U. S. N. M. 212,294	♂ adult	130.0	75.0	13.0	24.5
" 212,295	♂ im.	125.5	67.0	14.0	23.0
" 212,293	♀ adult	127.0	73.0	12.5	22.5

37. Ptilopus ponapensis (Finsch).

Ptilinopus ponapensis Finsch, Proc. Zool. soc. London, 1877, p. 779. (Ponapé. Caroline Islands).

Four males, one female, and another specimen, a mummy, with sex not marked, were secured on the Island of Uala in the Middle Carolines (Truk Group) on 16 February. These birds have a spot in front of the eye that extends back as a narrow superciliary stripe, and the middle of the throat and chin distinctly yellow, characters that are not mentioned by Dr. Finsch in his original description, nor by Count Salvadori in the British museum catalogue (1893, **21**, p. 93). A young male in juvenal plumage from Ponapé has these same markings indicated, so that there are no differences evident in the specimens at hand. Fully adult birds from Ponapé are not available for comparison. In these yellow markings *P. ponapensis* resembles *hernsheimi* from the Eastern Carolines.

Measurements of the specimens with the sex indicated follow: —

No.	*Sex*	*Wing*	*Tail*	*Exposed Culmen*	*Tarsus*
U. S. N. M. 212,287	♂	130.0	74.0	15.0	22.5
“ 212,288	♂	133.5	73.0	13.5	24.0
M. C. Z. 81,934 (“ 212,289)	♂	137.0	76.0	14.0	24.0
M. C. Z. 81,935 (“ 212,290)	♂	131.5	73.5	14.0	24.0
“ 212,291	♀	126.0	68.5	14.5	22.0

38. GLOBICERA AURORAE (Peale).

Carpophaga aurorae Peale, U. S. explor. exped., 1848, **8**, p. 201. (Aurora or Makatea Island).

A female was collected on Makatea Island 6 October, 1899. This bird is molting, and has not yet cast the six inner pairs of secondaries nor the second pair of rectrices. These old feathers are dull brown in color with a very slight gloss of blue, so that they are much duller than the bright new feathers. From a study of skins (including the types) in the U. S. N. M. collection it appears that *Globicera wilkesii* (Peale) (U. S. explor. exped., 1848, **8**, p. 203) described from Tahiti is a synonym of *Globicera aurorae*, as the differences between these supposed species are merely those of age (and perhaps of sex). *G. wilkesii* was said to be darker in color than *G. aurorae* and to have a smaller knob on the cere. In addition Peale ascribed to it twelve rectrices instead of fourteen but this difference in the number of tail feathers is due to an imperfection in the specimen that he chose for type. As regards color, specimens from Makatea are found that are as dark as those from Tahiti in corresponding plumage and the lighter birds may occur in either locality. The size and shape of the cere varies in individuals, regardless of locality, and may be seasonal in its growth, or may differ in the sexes. No differences in measurements are apparent, but only a few of the specimens examined have the sex given, and in part of those there is some doubt as to the correctness of the determination. There is apparently only one fully adult in the series of nine available, and this bird is sexed as a male. Peale remarks (*Opus cit.*, p. 204) that a specimen of *G. wilkesii* was obtained by Captain Wilkes on Aurora (Makatea) Island, and this specimen is still in the U. S. N. M.

39. GLOBICERA PACIFICA (Gmelin).

Columba pacifica Gmelin, Syst. nat., 1789, **1**, pt. 2, p. 777. (Friendly Islands).

A male and a female were secured on Funafuti in the Ellice Islands, 25 December, 1899. A species of pigeon was reported from this atoll for many years, and the fact that it belonged to this form was finally established by Mr. A. J. North (Rec. Austr. mus., 1898, **3**, p. 85).

40. GLOBICERA OCEANICA OCEANICA (Desmarest).

Columba oceanica Desmarest, Dict. sci. nat., 1826, **40**, p. 316. (Ualan – Kusaie).

An immature male was taken 8 February, and a female, 9 February, at Kusaie, the type-locality. The male is apparently fully grown but shows differences in color from the female that seem to be due to immaturity. The throat, malar region, and space behind the eye are more extensively white, and the feathers of the breast have faintly indicated paler tips. The lower breast is paler than the upper breast and the rufous of the lower breast is restricted by this paler color.

Measurements of these two specimens are as follows: —

No.	*Sex*	*Wing*	*Tail*	*Culmen from Cere*	*Tarsus*
U. S. N. M. 212,242	♀ adult	216.0	139.0	17.0	28.5
" 212,243	♂ im.	208.0	128.0	17.5	31.0

41. GLOBICERA OCEANICA TOWNSENDI, subsp. nov.

Characters.— Similar to *Globicera oceanica oceanica* (Desmarest) from Kusaie, Caroline Islands, but darker on upper breast, foreneck, hindneck, and upper back; no whitish line indicated on lower eyelid beneath eye; and under tail coverts paler.

Type.— U. S. N. M. 212,240. Adult female. Polynesia: Eastern Caroline Islands; Ponapé, 12 February, 1900. H. F. Moore.

Description.— Forehead, at base of bill white; crown, nape, hindneck, and upper scapular region between deep and dark neutral gray, changing to neutral gray immediately behind the white on the forehead; wing coverts, scapulars, back, rump, and upper tail coverts dull blackish green, the feathers iridescent, with darker green or very dark blue more or less distinctly indicated at the tips; primaries dull greenish black no. 2; visible portions of rectrices dull blackish green, the central pair with faintly indicated narrow darker crossbars; malar region, chin, and upper throat, whitish; side of head, throat, and sides of neck between deep and dark olive-gray; breast between mouse-gray and deep olive-gray; abdomen, tibiae, and under tail coverts russet; sides, flanks, and axillars dark neutral gray; bend of wing washed with rufous; bill and cere black; tarsus and toes brownish yellow, nails black (from dried skin).

Measurements.— Females (two specimens, no males seen) wing 221–223; tail 142.5–147; culmen (from cere) 17.5–18; tarsus 32–33.5.

Range.— Island of Ponapé.

Remarks.— Two adult females of this fine pigeon were collected on Ponapé, 11, 12 February, 1900. Both agree closely in color but one is slightly larger than the other. These two are distinctly darker than specimens from Kusaie and may be distinguished from them without difficulty. The type has the bend of the wing washed with rufous but this color is lacking in the second specimen.

LORIIDAE.

42. EOS RUBIGINOSA (Bonaparte).

Chalcopsitta rubiginosa Bonaparte, Conspec. gen. avium, 1850, **1**, p. 3. ("ex insulis Barbay, et Guebe." Later attributed correctly to Ponapé. *Cf.* von Pelzeln, Novara exped. Vögel, 1865, p. 99).

Two males, two females, and two mummies (dried from alcohol) were collected at Ponapé in the Eastern Caroline Islands, 12 February. Males and females are alike in coloration and size. This parrot was supposed to be a native of Waigiou for many years until discovered on Ponapé ("Puynipet") by the NOVARA expedition.

43. VINI AUSTRALIS (Gmelin).

Psittacus australis Gmelin, Syst. nat., 1788, **1**, pt. 1, p. 329. (Samoan Islands).

Three birds were secured at Niue or Savage Island, 25 November, and four were taken at Upolu in the Samoan Islands. The birds from the two localities appear identical in color and size. It is probable that these small parrots have been carried from island to island as cage-birds.

44. CHORIPHILUS PERUVIANUS (Müller).

Psittacus peruvianus Müller, Natursyst. Suppl., 1776, p. 80. ("Peru." Based on Buffon. Type-locality is here given as Tahiti, *cf.* Daubenton, Planches enlum., no. 455, fig. 2).

There are in the collection four skins of this small parrot from Rangiroa, Paumotu Islands, taken 21, 22, and 23 September, seven from Bora Bora, Society Islands, collected 17 November, and seven from Aitutaki, Cook Islands, secured 21 November. In addition five birds from Bora Bora were preserved as alcoholic specimens. The name *Psittacus taitianus* (Gmelin) (Syst. nat., 1788, **1**, pt. 1, p. 329) has been commonly applied to this parrot with *Psittacus peruvianus* given as a synonym. As Müller's name antedates that used by Gmelin and as there is no ground for supposing that his bird is not this species *Psittacus peruvianus* must be accepted. Müller gives Peru as the type-locality which is obviously erroneous. The type-locality is hereby restricted to Tahiti.

Two male birds from Rangiroa are in immature plumage. In both the breast is blackish. In one a few white feathers show on the ear coverts and throat while in the other the cheeks and a spot on the breast are white. The dark immature bird from Tahiti has been described by Sparrman (Mus. Carlson., 1787, fasc. 2, no. 27, pl. 27) as *Psittacus cyaneus*. More recently Mr. Scott B. Wilson (Ibis, 1907, p. 379, pl. 8) has named a bird in this same dark plumage from Bora Bora in the Society Group, calling it *Coriphilus cyaneus*. Later (Ibis, 1907, p. 653) on learning of the previous use of *Psitticus cyaneus* by Sparrman, Wilson renamed his bird *Coriphilus cyanescens*. On referring to his original description and the colored plate accompanying it there can be no question that this is an immature specimen of *C. peruvianus*.

The species does not seem to have been recorded from the Cook Islands before and though it is known from the Paumotu Islands apparently none have been collected previously on Rangiroa. Careful comparison of the series from the three localities represented reveals no differences in coloration but there are some slight differences evident in size. Two males from Aitutake average smaller than males from Bora Bora, Society Islands. Males from Rangiroa are likewise smaller than those from Bora Bora. From the present series however, it does not appear that these differences merit distinction by name.

Average measurements are as follows (in millimeters):—

Sex	*Locality*	*Wing*	*Tail*	*Culmen from Cere*	*Tarsus*
2 ♂♂	Aitutake	107.5	68.2	9.5	14.1
7 ♂♂	Bora Bora	114.6	70.5	10.1	15.8
4 ♂♂	Rangiroa	109.7	68.3	10.2	14.3

Females are represented from Aitutaki only. Four have the average wing measurement 104.9, tail 65.4, culmen from cere 9.4 and tarsus 14.6.

CUCULIDAE.

45. Urodynamis taitensis taitensis (Sparrman).

Cuculus taitensis Sparrman, Mus. Carlson., fasc. 2, 1787, **32**, pl. 32. (Tahiti).

An adult (sex not determined) was shot on Funafuti in the Ellice Group, 24 December. This cuckoo is said to be resident in both the Ellice and Gilbert Islands. In the latter group there are no other land birds, and in the Ellice Islands a pigeon is the only land bird known other than the cuckoo, so that there has been considerable speculation as to in what way this species practiced its parasitic habit of foisting its eggs upon other species for incubation and the rearing of its young. Concerning this the following observations by Mr. Swayne are of interest:—"In August last year I was at the Island of Niu, in the Ellice Group, and while walking through the island along with the local trader we passed a clump of 'buka' trees, in which, as is common throughout the Ellice Islands, there were numbers of the Noddies (*Anous stolidus*) nesting. I noticed that in one tree the birds were much disturbed and apparently frightened. The trader explained that the birds were disturbed by a 'Hawk.' We remained some time watching, and I saw our friend the Cuckoo drive a Noddy out of the nest and take possession of it, while the old birds and apparent proprietors tried in vain to dislodge the intruder. * * *

"I do not doubt that the Cuckoo was about to lay. * * *

"Although I offered rewards to the natives on many islands, I never was able to get an egg of the Cuckoo. In the Gilberts the people say they have never seen eggs or young, and, as I told you, they hold the tradition that the female takes a portion of the covering of the young palm-leaf and flying up with it deposits it on a cloud, lays her egg on it, where it is hatched by the sun." North, Proc. Zool. soc. London, 1896, p. 934.

It would be strange indeed if this remarkable bird could survive under the care and feeding of the Noddy, but this seems more plausible than that its young should be able to thrive (in the Ellice Islands) upon the vegetable food given young pigeons for their sustenance. Certainly the former belief is the more credible.

ALCEDINIDAE.

46. SAUROPATIS MEDIOCRIS (Sharpe).

Halcyon mediocris Sharpe, Cat birds Brit. mus., 1892, **17**, p. 260. (Ponapé).

A female was taken on Ponapé in the Eastern Caroline Islands, 12 February, 1900. In his original description Sharpe designates this bird as subspecies *b* of *S. cinnamomina* (Swainson) (though he uses a binomial name for it). The bird at hand differs from females of *S. cinnamomina* in having the under parts entirely white, the crown paler and the collar on the hind neck white instead of cinnamon. In addition the white collar is bordered behind by black and the back is more bluish. The differences are so great that *Sauropatis mediocris* seems (from the present material at least) to represent a full species.[1] *S. mediocris* agrees with the following species *S. sacra* in the form of its bill, and in having the tenth (outermost) primary shorter than the sixth and longer than the fifth.

---

[1] As has been pointed out by Seale (Occas. papers Bernice Pauahi Bishop mus., 1901, **1**, no. 3, p. 46) *Halcyon rufigularis* Sharpe (Cat. birds Brit. mus., 1892, **17**, p. 260) based on a skin received from the Zoölogical society of London, is the female of *Sauropatis cinnamomina* (Swainson).

47. SAUROPATIS SACRA SACRA (Gmelin).

Alcedo sacra Gmelin, Syst. nat., 1788, **1**, pt. 1, p. 453. (Type-locality hereby restricted to Tongatabu Island).

One male was taken on the Island of Tongatabu, 30 November. There are two other birds, a male and a female from the island of Nomuka taken 2 December, that have been referred to this form but are not typical of it as they are slightly duller in color than the bird from Tongatabu, and in addition are considerably smaller. Measurements are as follows:—

No.	*Sex*	*Locality*	*Wing*	*Tail*	*Culmen from Base*
U. S. N. M. 212,341	♂	Tongatabu Id.	105.0	73.5	44.0
" 212,340	♂	Nomuka Island	97.0	68.5	43.0
" 212,339	♀	" "	101.0	72.5	43.5

The birds from Nomuka are in worn plumage, which might account in part for the shortness of wing and tail. The single bird from Tongatabu, however, has a large heavy bill that is noticeably stronger and broader at the base than in any other specimen in the various forms of this species examined. Females of *Sauropatis sacra* in general differ from males in having the superciliary stripe whiter, in being decidedly more greenish above, and in having little or no blue apparent in the blackish feathers on the anterior surface of the tibia. In addition females are the larger of the two sexes.

In treating the geographical forms of *Sauropatis sacra* it becomes necessary to restrict the typical subspecies. Therefore, I designate the island of Tongatabu, in the Tonga Islands, as the type-locality of *Sauropatis sacra sacra.* The *Alcedo sacra* of Gmelin was based upon Latham's sacred Kingfisher (Latham, Gen. syn. birds, 1782, **1**, pt. 2, p. 621). Latham states that his bird had a blue band on the hind neck, in this agreeing with the forms found in the Tonga Islands. An island in this group therefore is selected as the type-locality for the typical form, as birds from the Fiji Islands have this band black or with only a trace of blue. The latter are to be known as *Sauropatis sacra vitiensis* (Peale) (U. S. explor. exped., 1848, **8**, p. 156).

This species has the tenth (outermost) primary slightly shorter than the sixth and longer than the fifth, and so does not agree wholly with the figure of the wing of *Sauropatis sanctus* given by Mathews

(Austr. avian record, 1912, 1, p. 107) in recognizing the genus Sauropatis of Cabanis and Heine. In that species the tenth primary is longer than the seventh and in *Halcyon senegalensis*, which is also figured by Mathews, the tenth primary is considerably shorter than the fifth. In the form of its bill *Sauropatis sacra* agrees closely with *S. sanctus*.

48. SAUROPATIS SACRA RABULATA, subsp. nov.

Characters.— Similar to *Sauropatis sacra sacra* (Gmelin) but darker, less greenish above, especially on head and rump.

Type.— U. S. N. M. 212,343. Male. Polynesia: Tonga Islands; Eua, 28 November, 1899. C. H. Townsend.

Description.— Crown and collar on hind neck dusky greenish blue; back, scapulars, tertials, and inner secondaries chessylite-blue; rump near motmot-blue; lesser and middle wing coverts Blanc's blue, the feathers edged more or less with Mathews's blue; first primary, tips and inner webs of other primaries, and under side of rectrices dull black; greater wing coverts, outer webs of primaries (except the first) and upper side of rectrices dusky greenish blue; superciliary stripe white mixed with cinnamon-buff; behind the eye this stripe is entirely cinnamon-buff, is broadened and unites with its fellow from the opposite side; malar stripe, extending from gape to unite with blue stripe on hind neck, chessylite-blue, the feathers black underneath so that the two colors are mixed; lores and a narrow line under eye black; a very narrow line of chessylite-blue over eye; spot on lower eyelid, collar on hind neck, and entire under parts white; anterior side of tibia blackish, with capri-blue tips on a few feathers.

Measurements.— Males (two specimens), wing 100–101; tail 69–70; culmen from base 41–42.5; tarsus, 15–15.3.

Female (one specimen) wing 104, tail 73.5, culmen from base 44, tarsus 16.5.

Range.— Island of Eua, Tonga Group.

Remarks.— The superciliary stripe in fully adult birds is white (as is shown by a female specimen) so that the type is not quite in full plumage. Adults and young after their first molt seem to differ in no other way.

The *Alcedo sacra* of Gmelin (Syst. nat., 1788, 1, pt. 1, p. 453) is based upon the Sacred Kingfisher of Latham (Gen. syn. birds, 1782, 1, pt. 2, p. 621) who described the bird from the Leverian Museum.

In his original description Latham states that his bird has "under the blue beneath the eye, a narrow orange ferruginous stripe." This marking is not found in the present species; and Von Pelzeln (Ibis, 1873, p. 19) who has examined Latham's type says that this marking is not indicated save for a slight tinge of yellowish under the auricular region. Latham states that his Sacred kingfisher inhabited Otaheite and the other Society Islands, an obvious error, as the species is not known save from the Tonga and Fiji groups.

Four specimens (three skins and one bird in alcohol) upon which this form is based were taken at Eua, Tonga Islands, on 28 November.

49. SAUROPATIS SACRA CELADA, subsp. nov.

Characters.— Similar to *Sauropatis sacra sacra* (Gmelin) but lighter, more greenish above, especially on the crown; malar stripe with little or no black indicated save at its posterior margin.

Type.— U. S. N. M. 212,347. Male. Polynesia: Tonga Islands; Vavau, 4 December, 1899. C. H. Townsend.

Description.— Crown, band on hind neck, back, scapulars, and tertials capri-blue; upper tail coverts bremen-blue; first primary, tips and inner webs of other primaries, and under side of rectrices blackish; outer webs of primaries (save first), greater wing coverts, and upper side of rectrices dark chessylite-blue; lesser and middle wing coverts china-blue; superciliary stripe white, mixed more or less with ochraceous buff, the stripes from either side meeting on back of head; lores black mixed with white, the black glossed with blue; malar stripe Blanc's blue; spot on lower eyelid, and entire under parts white; anterior side of tibia Blanc's blue, the feathers blackish basally.

Measurements.— Males (three specimens), wing 101–102.5 (101.8); tail 70.5–73 (72.0); culmen from base 41–42 (41.6); tarsus 16–16.5 (16.1).

Female (one specimen), wing 106.0, tail 76.5, culmen from base 45, tarsus 17.

Range.— Island of Vavau, Tonga group.

Remarks.— Four specimens of this form were taken at Vavau, Tonga Islands, 4 December. One bird, a male, nearly adult, is somewhat darker than the other two but is distinguishable from *S. s. sacra*. All of the males have more or less of buffy in the superciliary stripe a character which as has been noted above seems to be an indication of immaturity in this species, though this buffy color is less in amount in females than in males. The female specimen has no locality indicated on its label, but from its coloration is identified as belonging without doubt to this form.

50. HALCYON SACRA VITIENSIS (Peale).

Dacelo vitiensis Peale, U. S. explor. exped., 1848, **8**, p. 156. (Venua-levu, Feejee Islands).

One female referred to this form was taken at Kambara in the Fiji Islands, 7 December. Birds examined from the Fiji Islands differ constantly from specimens in the Tonga Group in having the dark band on the hind neck black, or with only an admixture of blue. In Tonga Island birds this band is entirely blue. Fijian birds too appear to be constantly smaller. Measurements of the bird taken on Kambara are as follows: —

No.	*Sex*	*Wing*	*Tail*	*Culmen from Base*
U. S. N. M. 212,338,	♀	93.0	65.5	42.5

51. TODIRHAMPHUS RECURVIROSTRIS Lafresnaye.

Todiramphus recurvirostris Lafresnaye, Rev. zool., 1842, p. 134. ("in insulis Maris Australis").

A single bird (sex not marked) was taken at Upolu in the Samoan Islands.

52. TODIRHAMPHUS TUTUS (Gmelin).

Alcedo tuta Gmelin, Syst. nat., 1788, **1**, pt. 1, p. 453. (Tahiti).

Five specimens were collected at Bora Bora in the Society Islands, 17 November. An immature male has the feathers of the upper breast buffy, with blackish cross bars forming a dark band across the breast. Three of the birds taken have the forehead white, while in the other two it is the same color as the crown, with white borders on the feathers. Immature birds are more greenish above than the adults.

Sharpe has stated (Hist. collections Brit. mus. Birds, 1906, p. 182) that the "Respected" and "Venerated" kingfishers described by

Latham (Gen. syn. birds, 1782, **1**, pt. 2, p. 623, 624) upon which Gmelin (Syst. nat., 1788, **1**, pt. 1, p. 453) founded his species *Alcedo tuta* and *A. venerata*, "seem to be the same species, and hence *Todirhamphus tutus*, Sharpe (nec. Gm.), Cat. birds, **17**, p. 291, will require another name, which I propose should be *Todirhamphus wiglesworthi*, in memory of the young explorer who did such good work as the historian of the Pacific Avifauna." On turning to Latham's descriptions it is found that the diagnosis of the "Venerated" Kingfisher is readily applicable to specimens of *Todirhamphus veneratus* at hand. His note on a band of glossy green on the hind neck "at which place it inclines to white" is true, as in some individuals white markings occur on the feathers in this region. In his account of the "Respected" Kingfisher Latham says distinctly "over the eye a white streak" which is one of the prominent differences between *T. tutus* and *T. veneratus*. So that there is no question but the "Respected" and the "Venerated" Kingfishers of Latham refer to separate species. From this it appears that the name *Alcedo tuta* of Gmelin is valid and that *Todirhamphus wiglesworthi* Sharpe must be placed in the synonymy of this species.

53. TODIRHAMPHUS VENERATUS (Gmelin).

Alcedo venerata Gmelin, Syst. nat., 1788, **1**, pt. 1, p. 453. (Said by Latham to come from Apia. As the bird does not occur there the type-locality is hereby stated to be Tahiti).

Five males and an immature female were secured at Tahiti, 3 October and 14 November, 1899. The immature bird has a broad brown band across the upper breast, and is brown with only a tinge of green above. The males all show a slight amount of brown on either side of the breast and in one a broken band is indicated by slender shaft streaks on the feathers of the upper breast.

MICROPODIDAE.

54. COLLOCALIA FRANCICA TOWNSENDI Oberholser.

Collocalia francica townsendi Oberholser, Proc. Acad. nat. sci. Philad., 1906, p. 197. (Eua, Tonga Islands).

Three specimens of this swift were secured in the Tonga Islands, one at Niue, 25 November, one (the type) at Eua 28 November, and one at Vavau, 4 December. The bird from Niue has the tips of the breast feathers entirely worn away.

55. COLLOCALIA THESPESIA Oberholser.

Collocalia thespesia Oberholser, Proc. Acad. nat. sci. Philad., 1906, p. 195 (Tahiti).

The type of this species, a female, was collected at Tahiti, Society Islands, 14 November, 1899.

56. COLLOCALIA OCISTA Oberholser.

Collocalia ocista Oberholser, Proc. Acad. nat. Sci. Philad., p. 184. (Nukuhiva).

Two specimens (including the type) were secured at Nukuhiva, 16 September, and one at Tahiti, 13 November. The bird from Tahiti, a male, has the breast feathers much worn.

HIRUNDINIDAE.

57. HYPUROLEPIS TAHITICA (Gmelin).

Hirundo tahitica Gmelin, Syst. nat., 1789, **1**, p. 2, p. 1016. (Tahiti).

Three were taken on Nomuka, Tonga Islands, 2 December. Only one of these, an adult female, has the sex indicated without question. The remaining two are immature birds that differ from the adult in having the chestnut of the forehead faintly indicated anteriorly and obsolete behind. In addition the blue-black spots on the under tail coverts are lacking, and in one bird there are faintly indicated pale margins on the feathers of the back. This species is known from the Tonga Islands but has not been reported from Nomuka previously. The large, broadened bill, characteristic of the genus Hypurolepis Gould, reaches its maximum development in this species, and appears remarkably strong and heavy for a swallow.

MUSCICAPIDAE.

HAPLORNIS, nom. nov.

The name Muscylva Lesson was first proposed in vernacular form in Lesson's Traité d'ornith., 1830, p. 385, with a proper diagnosis. In a following part of this same work on page 656 (published in 1831) the name Muscylva occurs in italics, this typography indicating that the author used it as a technical or Latin name, his intention in regard to this usage being outlined on page 651. Muscylva is therefore to be quoted from this second reference. Seven species are included in it by Lesson (p. 386) as follows:

Muscicapa leucogaster, Mus. de Paris. Cayenne. (Poiteau).
Muscicapa rufiventer, Mus. de Paris. Nouvelle-Hollande (Peron).
Muscicapa albogularis Mus. de Paris. Bengale. (Macé).
Muscicapa aurocapillus, Mus. de Paris.
Muscicapa caerulea, Gm.; le Petit azur; Enl., 666, fig. 1. Des îles Philippines, du Bengale.
Muscicapa luzoniensis Gm.; Levaill., pl. 151, fig. 1. De Madagascar.
Muscicapa rufiventer Gm.; l'Oranor, Levaill., pl. 155, fig. 1. De Batavia. (Diard.)

The first four of these names as listed above are *nomina nuda* at this place, although Pucheran (Arch. Mus. hist. nat., 1855, **7**, p. 333) found that the first is equivalent to *Rhipidura pectoralis* (Jerdon) and the second to *Rhipidura rufiventris* (Vieillot). The third was described later by Lesson (Bélanger's Voyage Indes Orientales, 1831, pl. 264) as *Muscicapa* (*Muscylva*) *albogularis,* which equals *Rhipidura albicollis* (Vieillot). Pucheran states that he was unable to find the type of *Muscicapa auricapillus.*

On examining the remaining species in turn it is found that *Muscicapa caerulea* Gmelin is now placed in the genus Hypothymis, while *Muscicapa luzoniensis* Gmelin is in the genus Penthornis. The seventh species, *Muscicapa rufiventris* Gmelin, is apparently still unidentified, although "l'Oranor" of Levaillant is considered to be *Pericrocotus peregrinus* (Linné). From this consideration it appears that of the seven names mentioned by Lesson under the genus Muscylva, only the last three are at all recognizable at the place of original publication, as the first four are *nomina nuda.* From this it appears therefore that G. R. Gray, (Handlist of birds, 1869, **1**, p. 349) was in error when he restricted Muscylva to the first species given by Lesson, *Muscicapa leucogaster.* On the page cited he adopted Muscylva as a subgenus of Todirostrum, and under it listed *M. leucogaster* "Less. ex Mus. Par." from "Cayenne." On page 332 of the same volume of this publication he had already included Muscylva "Homb. & J." as a subgenus of Rhipidura.

The type of Muscylva Lesson, 1831, has never been properly designated, although Lesson (Compl. oeuvres Buffon, 1837, **8**, p. 366) himself cited "*Muscicapa albogularis*" as the type. As it has been shown that this species was a *nomen nudum* in the original reference this designation is not valid. To eliminate the name Muscylva Lesson 1831 the type is here fixed as *Muscicapa caerulea* Gmelin, reducing Muscylva to a synonym of *Hypothymis* Boie, 1826.

In 1846, G. R. Gray (Gen. birds, 1846, **1**, p. 258) named a bird from the Fiji Islands *Rhipidura lessoni*, basing the species on the "Muscylva de Lesson" of Hombron and Jacquinot (Voy. Pôle Sud. Zool., October, 1844, **3**, pl. 11, fig. 2, Oiseaux). This bird was later described by Jacquinot and Pucheran on page 75, vol. **3**, of the text of the work just cited, published in 1853, as *Muscylva lessoni*. With it was described another species, *M. pectoralis*. Muscylva was not designated as a new genus by these authors and it was not intended as new, but the name has been generally accredited to them since the date of its appearance in the Catalogue of birds in the British Museum (Sharpe, 1879, **4**, p. 233). It is evident from the outline above that the status of Muscylva as a generic term was in hopeless confusion, so that it has seemed best to eliminate it and substitute a new name to avoid future complications. Following are emendations of Muscylva that have appeared:

Muscicylva Gray, Gen. birds, 1849, **3**, app., p. 53.
Muscisylvia Agassiz, Nom. zool. Aves, 1841, p. 88. (Not *Muscisylvia* Hodgson, 1844 and 1845).
Muscyla Gray, Cat. gen. and subgen. birds, 1855, p. 51.

58. HAPLORNIS LESSONI (G. R. Gray).

Rhipidura lessoni Gray, Gen. birds, 1846, p. 258. (Fiji Islands).

There are in the collection four "mummies" of this species, with sex not indicated, that were collected at Viti Levu, Fiji Islands, 16 December. The specimen of this bird that Peale (U. S. explor. exped., 1848, **8**, p. 101) described as *Monarcha cinereus* was secured on this same island.

59. METABOLUS RUGENSIS (Hombron and Jacquinot).

Muscicapa rugensis Hombron and Jacquinot, Ann. sci. nat., 1841, ser. 2, **16**, p. 312. (Ruk Islands).

An adult male was secured at Uala in the Truk Group (Middle

Caroline Islands), 16 February, 1900. This bird has extensive dark markings on the inner webs of the third, fourth, fifth, and sixth primaries and smaller areas on the other primaries, save the first, which is entirely white with a dark shaft. A spot in the center of the forehead (entirely surrounded by black) is white and there are two black feathers on the right side of the hind neck.

60. RHIPIDURA KUBARYI Finsch.

Rhipidura kubaryi Finsch, Proc. Zool. soc. London, 1875, p. 644. (Ponapé).

A male secured on Ponapé in the Eastern Carolines on 12 February, 1900, has the following measurements:—wing 76, tail 89.5, exposed culmen 10.5, tarsus 20.5.

61. MYIAGRA PLUTO Finsch.

Myiagra pluto Finsch, Proc. Zool. soc. London, 1875, p. 644. (Ponapé).

Two males, a female, and one other bird (a mummy, unsexed) were collected at Ponapé, 11 February, 1900. Both males have a brownish wash on the feathers of the chin, throat, and upper breast, a character that Dr. Finsch in his original description assigned to the female. This is indicated only slightly in the female in the present collection. The crown cap in both sexes is distinctly darker than the back with a sharp line of demarcation behind. It is probable that the two males are immature. The mummy may be an almost adult male, as it has the wash barely indicated on chin and throat, and in addition has the feathers of the upper breast glossed with bluish.

Measurements of the birds with sex indicated are as follows: —

No.	*Sex*	*Wing*	*Tail*	*Exposed Culmen*	*Tarsus*
U. S. N. M. 212,467	♂	80.0	74.3	12.5	20.5
" 212,468	♂	78.5[1]	76.0	12.5	20.0
" 212,470	♀	81.0	75.0	14.0	22.0

62. MYIAGRA OCEANICA Jacquinot and Pucheran.

Myiagra oceanica Jacquinot and Pucheran, Voy. Pôle Sud. Zool., 1853, **3**, p. 77. (Hogoleu).

A male and a female were secured at Uala in the Truk Group,

---

[1] Wing somewhat worn.

Middle Carolines, 16 February. The measurements of these two birds are as follows:

No.	*Sex*	*Wing*	*Tail*	*Exposed Culmen*	*Tarsus*
U. S. N. M. 212,471	♂	80.5	67.8	15.0	20.0
" 212,472	♀	76.5	63.5	15.0	21.5

63. MYIAGRA TOWNSENDI, sp. nov.

Characters.— Similar to *Myiagra vanikorensis* (Quoy and Gaimard) but adult male with back heavily glossed with green, glossy green of anterior under parts covering entire upper breast, posterior under parts darker, thighs blackish, under wing coverts darker, bill larger, tail and tarsus longer: Female with outer web of outer tail feathers extensively paler, crown grayer, back strongly washed with brown, and loral region distinctly lighter than feathers of crown.

Type.— U. S. N. M. 212,464. Adult male. Polynesia: Fiji Islands; Kambara, 7 December, 1899, C. H. Townsend.

Description.— Crown, nape, upper back, sides of head, throat, and upper breast iridescent greenish slate-black; lower back, rump, and upper tail coverts between slate-gray and slate color, the feathers glossed with deep slate-green; wing and tail feathers sooty black; lesser and middle coverts iridescent greenish slate-black; greater coverts black with outer webs of feathers glossed with iridescent greenish slate-black; inner tertials more or less iridescent; lower breast amber-brown, becoming ochraceous tawny on sides and flanks, and merging into warm buff on the middle of the abdomen, lower tail coverts and sides of rump; thighs black, the feathers tipped with brown; under wing coverts light buff tipped with warm buff; bill and tarsus (in dried skin) black.

Measurements.— Males (two specimens) wing 76.0–77.5; tail 67.0; exposed culmen 14.5–15.2; tarsus 18.5–19.0.

Range.— Kambara, Fiji Islands.

Remarks.— Four specimens were collected on Kambara in the Fiji Islands, 7 December. Two (including the *Type*) are adult males and a third with the sex not indicated is supposed to be a female. A description of this latter bird is as follows: — Crown and hind neck dusky green-gray; sides of head and collar on hind neck slate color; anterior portion of crown washed with mouse-gray; lores indistinctly whitish; back, scapulars, rump, and upper tail coverts between buffy brown and olive-brown; wings and tail dull black; lesser wing coverts between buffy brown and olive-brown; middle and greater coverts dull black tipped with this same brown; inner secondaries margined all around with light buff; rectrices tipped indistinctly with whitish; outer web of outer rectrix cream-buff; inner web edged with whitish; breast honey-yellow; feathers of throat with bases white, washed with honey-yellow; color of under parts changing to cinnamon-buff on abdomen, sides and under tail coverts; bill (in dried skin) brown.

The remaining specimen is marked questionably as an immature male. It resembles the female in general, but has the dark, adult plumage appearing on the upper surface. Beneath it is paler than the female, and has the throat almost white. The bill is black as in the adult males.

This fine species may be distinguished readily from *Myiagra vanikorensis* (Quoy and Gaimard), to which it is allied, by its much darker coloration, and larger, heavier bill.

SYLVIIDAE.

64. CONOPODERAS ATYPHA, sp. nov.

Characters.— Similar to *Conopoderas caffra* (Sparrman) but upper parts duller brown, pale margins on feathers of dorsal surface nearly obsolete, wing much shorter, bill shorter.

Type.— U. S. N. M. 212,493. Male. Polynesia: Paumotu Islands; Fakarava, 11 October, 1899. C. H. Townsend.

Range.— The Paumotu Islands, Polynesia (specimens examined from the following islands: — Whitsunday, Akiaki, Makemo, Apataki, Fakarava, Carlshoff, Tikei, Rangiroa, Makatea, and Hereheretue).

Remarks.— This distinct species is represented by a series of forty-two specimens. In this material there are six forms (including the typical one) that may be considered as subspecies.

As has been pointed out by Oberholser (Proc. U. S. N. M., 1905, **28**, p. 900) *Turdus longirostris* of Gmelin (Syst. nat., 1789, **1**, pt. 2, p. 823) based on Latham's long-billed thrush from the Island of Eimeo, is preoccupied by *Sitta caffra* of Sparrman (Mus. Carlson., 1786, fasc. 1, no. 4, pl. 4). As Sparrman assigns no locality for his bird the type-locality of *Sitta caffra* Sparrman is hereby designated as Tahiti, as this is the probable place from which his specimens came.

Conopoderas atypha apparently occurs upon most if not all of the islands in the Paumotu Archipelago. With series from all the localities several forms in addition to those described here will be found without doubt. There is much variation in this species in specimens from the same localities. Specimens that have the entire plumage strongly suffused with rufescent color are common, and a very gray phase is also evident. In addition some specimens are more or less albinistic, and there is considerable individual variation in length of wing and tail without reference to locality. All these are confusing, and the actual divisions and relationships among the birds from different islands are evident only after careful study and comparison.

In the present study of this species no attempt is made to define the form inhabiting the isolated island of Hereheretue, as the only specimen taken there was preserved in spirits, but there is little question but that it is distinct. The delicate grays, browns, and yellows found in the plumage of *Conopoderas atypha* are liable to injury from immersion in alcohol, so that this bird is not available for color comparison. Measurements of the specimen are as follows:— wing 87.0, tail 84.0, exposed culmen 20.0, tarsus 29.5. It will be seen from these that the tail is longer than in any other specimen available at this time, while the culmen and tarsus are short when compared with the length of wing. Apparently the bird was pale below and quite brown above. To assign a subspecific name to this specimen under the circumstances would lead to confusion, so that it is merely listed here under the general discussion of the species.

Following are the subspecific forms of *Conopoderas atypha* at present recognized.

64. CONOPODERAS ATYPHA ATYPHA.

Description.— *Type* p. 206. Crown, hind neck, back, and scapulars olive-brown, the feathers of back edged more or less with paler; rump between honey-yellow and isabella color; upper tail coverts buffy brown; rectrices olive-brown, the outer pair edged with whitish and all save the two middle pairs tipped with whitish; remiges olive-brown, the feathers margined with tilleul-buff, tertials both margined and tipped with tilleul-buff; wing coverts olive-brown, the greater coverts tipped obscurely with dull ivory-yellow; spot on lower eyelid and superciliary stripe (extending forward to base of bill) ivory-yellow; loral feathers fuscous, tipped with ivory-yellow; streak behind eye olive-brown; throat and breast whitish, washed lightly with cartridge-buff; center of abdomen whitish; sides, flanks, bend of wing, under wing coverts and under tail coverts, dull pinkish buff; tibia pinkish buff.

Measurements.— Males (nine specimens), wing 82.5–89.6 (86.6); tail 70–80 (74.3); exposed culmen 19–22 (20.3); tarsus 29.5–31.5 (30.6). Female (1 specimen), wing 88.0; tail 75.5; exposed culmen 19.2; tarsus 27.6.

Range.— Fakarava, Carlshoff, and Tikei Islands, Paumotu Islands.

Remarks.— Two males and one female were secured at Tikei, 9 October, and six males and one alcoholic specimen were collected at Fakarava, 11 October. Specimens from Tikei are very slightly darker above than those from Fakarava. One bird from Carlshoff Island (secured by Peale) is more buffy below. The present material does not serve as sufficient grounds for recognizing these differences by name.

65. CONOPODERAS ATYPHA RAVA, subsp. nov.

Characters.— Similar to *Conopoderas atypha atypha* but under surface washed with massicot-yellow, under tail coverts averaging paler, less buffy, and superciliary stripe massicot-yellow, most obscure anteriorly.

Type.— U. S. N. M. 212,516. Male. Polynesia: Paumotu Islands; Whitsunday Island, 31 October, 1899. C. H. Townsend.

Description.— Crown, hind neck, back, and scapulars between buffy brown and olive-brown; rump and upper tail coverts buffy brown, the rump washed with deep olive-buff; rectrices, remiges, and wing coverts olive-brown; outer pair of rectrices margined lightly, and three outer pairs tipped slightly, with paler; greater wing coverts and inner tertials with paler tips and margins; primaries and secondaries margined with deep olive-buff; spot on lower eyelid and superciliary stripe above eye massicot-yellow, the superciliary becoming obscure as it passes forward to base of bill; loral feathers fuscous with pale tips; auricular region dark olive-buff; under surface washed strongly with massicot-yellow, sides and flanks washed with brownish cream-buff; under tail coverts between pale olive-buff and olive-buff; bend of wing and under wing coverts washed with cream color; tibia olive-buff.

Measurements.— Males (four specimens) wing 84.5–90.0 (87.6); tail 72.0–76.0 (74.8); exposed culmen 18.5–20.5 (19.6); tarsus 29.2–30.7 (29.8).

Female (one specimen) wing 83.5; tail 67.0; exposed culmen 20.5; tarsus 31.0.

Range.— Whitsunday and Akiaki Islands, Paumotu Islands.

Remarks.— A male was taken on Akiaki, 30 October, and three males and one female on Whitsunday Atoll 31 October. The distinctly yellow cast of the under parts serves to distinguish this form from the other subspecies of *Conopoderas atypha* at present known. There is available only one bird from Akiaki and examination of more material will show without doubt that birds from this island are readily separable from those from Whitsunday. The single specimen at hand, a male, differs from birds from Whitsunday in being distinctly more buffy below, especially on the lower tail coverts. In addition it has the rump paler and the tail more extensively tipped with white.

66. CONOPODERAS ATYPHA CRYPTA, subsp. nov.

Characters.— Similar to *Conopoderas atypha atypha* but distinctly grayer above, and whiter, less buffy, below.

Type.— U. S. N. M. 212,507. Male. Polynesia: Paumotu Islands; Makemo, 20 October, 1899. C. H. Townsend.

Description.— Crown, hind neck, back, and scapulars hair-brown, the feathers with paler tips and edgings; rump dull avellaneous; upper tail coverts drab; rectrices, remiges, and greater wing coverts olive-brown; rectrices with slightly indicated pale margins, the four outer pairs tipped with whitish; lesser and middle wing coverts drab, margined indistinctly with pale drab-gray; primaries and secondaries margined with pale drab-gray; spot on lower eyelid and superciliary stripe above eye ivory-yellow, the superciliary more or less obscure anteriorly; loral feathers fuscous with pale tips; auricular region between deep and dark olive-buff, becoming dark olive-buff posteriorly; throat and breast whitish washed with marguerite-yellow; this color becoming gradually buffy posteriorly until the under tail coverts are light buff; bend of wing, under wing coverts, sides and flanks light buff.

Measurements.— Males (three specimens) wing 89.5–90.0 (89.8); tail 77.0–80.0 (78.1); exposed culmen 20.2–21.0 (20.5); tarsus 30.0–31.0 (30.6).

Range.— Makemo Island, Paumotu Islands.

Remarks.— Three males, one specimen with sex not indicated, and two birds preserved in alcohol, were secured on Makemo, 20 October.

One male in the series examined has a strong rufescent wash on the entire plumage, the reddish suffusion being especially marked on the rump and posterior under parts. The others agree in being uniformly of a grayish cast.

67. CONOPODERAS ATYPHA AGASSIZI, subsp. nov.[1]

Characters. — Similar to *Conopoderas atypha crypta* but back slightly grayer, crown distinctly darker than the back.

Type.— U. S. N. M. 212,491. Male. Polynesia: Paumotu Islands; Apataki, 7 October, 1899. C. H. Townsend.

Description.— Crown slightly grayer than olive-brown; hind neck, back, scapulars, and upper tail coverts between drab and hair brown; rump between smoke-gray and light grayish olive; rectrices and remiges olive-brown; lesser and middle wing coverts drab; greater wing coverts olive-brown, each feather margined broadly with drab; rectrices and remiges margined lightly with drab or light drab; no light tips evident on rectrices; spot on lower eyelid, and superciliary stripe above and behind eye olive-buff, the superciliary more or less obscure anteriorly; loral feathers fuscous with obscure paler tips; auricular region between drab and hair-brown, paler anteriorly; under surface whitish; throat, middle of breast, and upper abdomen washed lightly with pale olive-buff; lower abdomen and under tail coverts whitish; sides of breast becoming strongly grayish; under wing coverts whitish; bend of wing marguerite-yellow.

Measurements.— Male (one specimen, *Type*) wing 89.0; tail 77.7; exposed culmen 19.0; tarsus 28.0.

Range.— Island of Apataki, Paumotu Islands.

Remarks.— One specimen, the type, was secured on Apataki, 7 October. This bird is nearest the form inhabiting Makemo Island, but differs from it in several particulars, none of which come within the range of individual variation as shown in the entire series of *Conopoderas atypha* examined. The crown is distinctly darker than the back, and in addition the under wing coverts and under tail coverts are much paler.

68. CONOPODERAS ATYPHA NESIARCHA, subsp. nov.

Characters.— Similar to *Conopoderas atypha atypha* but bill shorter; coloration above averaging more brownish, below more heavily suffused with buff.

---

[1] Named in honor of Alexander Agassiz.

Type.— U. S. N. M. 212,511. Male. Polynesia: Paumotu Islands; Rangiroa, 21 September, 1899. C. H. Townsend.

Description.— Crown, back, and scapulars between buffy brown and olive-brown; hind neck buffy brown; rump dresden-brown; upper tail coverts Saccardo's umber; rectrices and remiges olive-brown (somewhat faded); lesser wing coverts buffy brown; middle and greater wing coverts olive-brown, margined with buffy brown, remiges edged with buffy brown; rectrices tipped obscurely with tilleul-buff; lores, spot on lower eyelid and superciliary stripe cream-buff; malar region ivory-yellow; auricular region drab, with a wash anteriorly of olive-yellow; under surface pale olive-buff; sides of breast washed with buffy brown; sides and flanks washed with isabella color; under tail coverts pinkish buff; bend of wing and under wing coverts pinkish buff.

Measurements.— Males (four specimens) wing 84.2–89.5 (87.8); tail 72.0–78.5 (75.0); exposed culmen 18.3–18.5 (18.4); tarsus 29.0–31.2 (30.1).

Female (one specimen) wing 83.0, tail 70.5, exposed culmen 19.0, tarsus 29.5.

Range.— Island of Rangiroa, Paumotu Islands.

Remarks.— Four males, one female, and a specimen preserved in alcohol were collected on Rangiroa on 21, 22, and 23 September. This form is more buffy below than any of the other subspecies of *Conopoderas atypha* examined, save the one from Makatea (a description of which follows), and the short bill serves to distinguish it at once from all others. The single female examined is grayer above and less buffy below than the males. One male shows a tendency toward albinism, as it has a light bar across the ends of the inner greater coverts.

69. CONOPODERAS ATYPHA EREMA, subsp. nov.

Characters.— Similar to *Conopoderas atypha atypha* but larger; bill longer and heavier; coloration above brighter brown, rump more rufous, more buffy below especially on breast, sides, and flanks; tail more distinctly tipped with white.

Type.— U. S. N. M. 212,505. Male. Polynesia: Paumotu Islands; Makatea, 6 October, 1899. C. H. Townsend.

Description.— Crown and hind neck slightly darker than buffy brown; back and scapulars olive-brown, the feathers margined rather obscurely with dull pinkish buff; rump between clay color and tawny olive; upper tail coverts Saccardo's umber; rectrices and remiges olive-brown; lesser wing coverts tawny olive; middle and greater coverts olive-brown the feathers margined with pinkish buff; outer web of outer tail feather and tips of others obscurely white; rest of rectrices and remiges margined with pale olive-buff; superciliary stripe and spot on lower eyelid cream-buff; superciliary distinct; lores dull white; auricular region changing from dull cream-buff anteriorly to buffy brown posteriorly; throat and upper breast and abdomen washed with ivory-yellow; lower breast washed with chamois, this color deepening somewhat on the sides; flanks washed with cinnamon-buff; under tail coverts pinkish buff; bend of wing pinkish buff; under wing coverts between pinkish buff and cinnamon-buff.

Measurements.— Males (four specimens) wing 88.2–91.5 (90.1); tail 78.2–82.0 (79.4); exposed culmen 21.0–22.5 (22.0); tarsus 30.0–33.5 (31.5).

Range.— Island of Makatea, Paumotu Islands.

Remarks.— Four specimens were secured on Makatea Island, 26 September, and two more were added to the collection from the same locality, 6 October. Four of these birds are males; the other two do not have the sex indicated certainly. This is the most distinct of all the forms of *Conopoderas atypha* at present known, a circumstance to be expected as Makatea is cut off by deep ocean from the main Paumotu Group. The central islands lie on a plane bounded by the thousand fathom curve, while Makatea is outside of this irregular line.

Two specimens show an indication of albinism. One has the rectrices, save for the two central pairs, entirely white. In the other one the outer rectrix is white, and there are irregular white blotches on the tips of the others. In size, and in more prominent pale margins on the feathers of the dorsal surface this form shows a very slight approach toward *Conopoderas caffra* of Tahiti. It is so distinct, however, in its much browner coloration, smaller size, and general appearance that it cannot be considered as a connecting link between that species and *C. atypha*. *C. a. erema* is distinguished from all other forms of *C. atypha* known at present by its larger size, longer bill, and much more buffy plumage. The differences are in fact almost sufficient to give it recognition as a separate species. In view of the great variation in the wide ranging *C. atypha*, however, it seems better to consider the Makatea bird as a subspecies.

70. CONOPODERAS PERCERNIS, sp. nov.

Characters.— Similar to *Conopoderas mendanae* (Tristram), but outer web of the external rectrices dusky (with only a faint yellow margin), more yellow below, with basal portion of the inner webs of the primaries white very faintly tinged with yellow.

Type.— U. S. N. M. 212,479. Male. Polynesia: Marquesas; Nukuhiva, 15 September, 1899.

Description.— Feathers of crown and line behind eye, with centers deep olive to dark olive, this color merging into a broad margin of light yellowish olive; neck, back, and scapulars between yellowish olive and dark greenish olive, this color changing to light yellowish olive on the tips of the feathers on back and scapulars, on rump changing to deep colonial-buff; upper tail coverts light brownish olive with margins more yellowish; feathers of wings and tail fuscous black; primaries edged with light yellowish olive; secondaries edged broadly with colonial-buff and primaries and secondaries tipped with marguerite-yellow; wing coverts fuscous, margined broadly with colonial-buff; rectrices tipped with marguerite-yellow, the tips broader on the external feathers, lessening in extent, especially on the inner webs, toward the central pair; outer pair with a very narrow obscurely indicated paler margin for distal half; under surface, save abdomen, barium-yellow to citron-yellow; center of abdomen white; lores whitish; superciliary stripe, malar and auricular region, and bend of wing strontian-yellow; under wing covers naphthalene-yellow; inner webs of primaries for basal half white.

Measurements.— Seven males wing 98.6–103.0 (100.5); tail 86.2–92.3 (88.7); exposed culmen 22.5–24.0 (23.3); tarsus 31.0–33.3 (32.4).

Range.— Island of Nukuhiva, Marquesas Islands.

Remarks.— This species is represented by nine skins, two mummies, and an alcoholic specimen secured at Nukuhiva, 15, 16 September, 1899. The series is remarkably constant in coloration, there being no tendency toward albinism such as is often found in the island inhabiting species of this genus. The seven birds that have the sex determined are males.

No specimens of *Conopoderas mendanae* (Tristram) are available for comparison, but an excellent description is found in the Catalogue of birds in the British museum, 1883, **7**, p. 526, and with the original description of Canon Tristram (Ibis, 1883, p. 43) is given a colored figure that shows the characters of the bird distinctly. In this plate of *C. mendanae* the yellow of the outer tail feathers is especially noticeable. Twelve specimens in all of *Conopoderas percernis* have been examined, and all are constant in the characters assigned in the diagnosis above.

71. CONOPODERAS SYRINX (Kittlitz).

Sylvia syrinx Kittlitz, Mem. Acad. imper. sci. St. Petersburg, 1835, **2**, livr. 1, p. 6, pl. 8. (Lugunor and Uleei).

One female was taken at Ponapé, Eastern Carolines, and one male, two females and an immature bird (mummy) come from Uala in the Truk Group, collected 16 February, 1900. There are two forms indicated in this material, but as specimens that may be considered typical *C. syrinx* of Kittlitz are not available for comparison it is not advisable to separate them at this time. Kittlitz described this bird from the Lugunor and Uleei Groups. Finsch (Journ. Mus. Godeffroy, 1876, **12**, p. 30) says that Kittlitz also included birds from Ualan. Specimens from none of these localities are available in the U. S. N. M. collections. The birds from Uala, together with a specimen marked Ruk collected by Kubary, differ from the bird from Ponapé in being distinctly paler. The head and neck are less brownish, especially on the sides of the neck, and are much grayer than the back. The rump and upper tail coverts are paler, and the under parts are less extensively cinnamon-buff especially on the sides and under tail coverts. Birds from the two islands agree in measurements.

CONOPOPHAGIDAE.

72. LALAGE PACIFICA (Gmelin).

Turdus pacificus Gmelin, Syst. nat., 1789, **1**, pt. 2, p. 813. (Friendly Islands).

Three males were taken at Eua, 28 November, two males at Tongatabu, 30 November, a female at Nomuka, 2 December, and two males at Vavau, 4 December, all in the Tonga Group. In addition a female was secured at Kambara, 7 December, and a male in immature plumage at Viti Levu 18 December, in the Fiji Islands.

Birds from Eua have the rump slightly paler and average a trifle larger than others but the differences are too slight to be dependable in such a small series. Average measurements of males from the Tonga Islands follow.

Sex	*Locality*	*Wing*	*Tail*	*Exposed Culmen*	*Tarsus*
2 ♂♂	Vavau	96.7	66.7	13.5	25.9
2 ♂♂	Tongatabu	99.0	66.5	13.5	25.9
3 ♂♂	Eua	99.2	67.1	14.0	27.1

73. LALAGE WHITMEEI Sharpe.

Lalage whitmeei Sharpe, Mittheil. K. zool. mus. Dresden, 1878, p. 371. (Savage Island).

Four males and two females were secured at Niue, or Savage Island, 25 November. Both of the females are immature. Each shows a strong wash of bright brown on the lesser and middle wing coverts.

LANIIDAE.

74. PACHYCEPHALA JACQUINOTI Bonaparte.

Pachycephala jacquinoti Bonaparte, Conspec. gen. Avium, 1850, **1**, p. 329. (Vavau).

Four adult males and one male in immature plumage were collected at Vavau, Tonga Islands, 4, 5 December. The male in juvenal plumage is duller in color than the adults, and has the crown deep mouse-gray with a few feathers of the adult plumage showing. The chin and throat are whitish, the feathers tipped with deep mouse-gray, especially laterally, and the upper breast is light drab. A few black feathers show here also. The side of the head is light grayish olive, and the auricular region wood-brown. The light ring on the hind neck is barely indicated, and the under parts are much paler yellow.

Gray (Gen. birds, 1845, **1**, p. 271) lists this form under Pachycephala and refers to the plate published by Hombron and Jacquinot (Voy. Pôle Sud. Zool. Oiseaux, October, 1844, pl. 5, fig. 2) where the bird is called "Pie-grièche à masque noir" but does not designate a name for it.

PRIONOPIDAE.

75. PINAROLESTES HEINEI (Finsch and Hartlaub).

Myiolestis heinei Finsch and Hartlaub, Proc. Zool. soc. London, 1869, p. 546. (Tonga Islands).

Two males and three females were secured at Nomuka, 2 December. The light margin of the edges of the mandibles seems very characteristic in this species. The sexes are similar in color. There seem to be no previous records of the species from this island.

76. PINAROLESTES NESIOTES, sp. nov.

Characters.— Similar to *Pinarolestes vitiensis* (Hartlaub) but larger, with heavier bill, and with white tips absent on four central rectrices and more restricted on the remaining feathers.

Type.— U. S. N. M. 212,438. Female. Polynesia: Fiji Islands; Kambara, 7 December, 1899. C. H. Townsend.

Description.— Crown and hind neck mummy-brown, changing to raw umber on the back and rump; wing and tail fuscous, the wing coverts, outer webs of primaries and edgings of secondaries raw umber; rectrices save the two central pairs lightly tipped with white; four central tail feathers immaculate, with darker cross bars faintly indicated in certain lights; throat, breast, and abdomen smoke-gray; feathers of forehead with smoke-gray bases, forming an obscure patch of pale color; eye ring and lores obscurely blackish; auricular region hair-brown; rami, sides of head behind eye, sides of neck, and sides of breast light grayish olive; sides of abdomen and flanks washed with cinnamon-brown; under tail coverts buffy brown; tibia mouse-gray.

Measurements.— Female (*Type*) wing 95; tail 80; exposed culmen 21; tarsus 25.

Range.— Island of Kambara, Fiji Islands.

Remarks.— One female (the *Type*) was secured at Kambara, Fiji Islands, 7 December, 1899. The genus does not seem to have been known from this island previously. Study of a large series of Pinarolestes of the *vitiensis* group will probably show that the bird described here is a subspecies of *vitiensis*. As given by Sharpe (Cat. birds Brit. mus., 1877, **3**, p. 300) the wing of *P. vitiensis* (sexes not indicated) varies from about 79 to 86 millimeters. As females in this genus are smaller than males it appears that the bird described here is a very large form. *Pinarolestes nesiotes* appears to resemble *P. compressirostris* (Layard), as it has a large and somewhat compressed bill, but differs from that form (judging from descriptions) in larger size, and shorter bill, while in addition it lacks white tips on the central tail feathers.

STURNIDAE.

77. ACRIDOTHERES TRISTIS (Linné).

Paradisea tristis Linné, Syst. nat., ed. 12, 1766, **1**, p. 167. ("Philippines.").

A male of this species was collected on Viti Levu, in the Fiji Islands, 14 December. There seem to be no previous records of this species here, and no information is available at present to show when it was introduced.

EULABETIDAE.

78. APLONIS TABUENSIS (Gmelin).

Lanius tabuensis Gmelin, Syst. nat., 1788, **1**, pt. 1, p. 306. (Friendly Islands).

Of seven specimens that were collected four were taken on Eua, 28 November, two on Nomuka, 2 December, and one on Vavau, 4 December, all in the Tonga Group. One does not have the sex indicated, the others are all males. Specimens from the three localities agree closely. The single bird from Vavau has the tarsus longer, and is somewhat clearer gray below than the others, while birds from Eua have the dark mark on either side at the base of the mandible slightly more prominent. Otherwise the specimens in the series are very similar. Measurements follow: —

No.		*Sex*	*Locality*	*Wing*	*Tail*	*Exposed Culmen*	*Tarsus*
U. S. N. M.	212,373	♂	Eua	113.0	63.0	20.5	27.0
"	212,374	♂	"	112.0	64.5	22.0	30.0
"	212,376	♂	"	114.5	70.0	20.0	27.0
"	212,377	♂	Nomuka	111.0	67.5	21.0	29.0
"	212,378	♂	"	114.0	63.5	20.5	29.5
"	212,372	♂	Vavau	113.5	68.5	20.0	33.0

79. APLONIS VITIENSIS Layard.

Aplonis vitiensis Layard, Proc. Zool. soc. London, 1876, p. 502. (Fiji Islands).

A female was taken on Kambara in the Fiji Islands, 7 December. This bird is an adult in very worn plumage.

80. APLONIS BRUNNESCENS Sharpe.

Aplonis brunnescens Sharpe, Cat. birds Brit. mus., 1890, **13**, p. 132, pl. 6. (Savage Island).

There are in the collection six skins and one alcoholic specimen collected on Niue or Savage Island, 25 November. The sexes are apparently similar in color, but females have the wing averaging shorter than males. One male has a strong rufescent wash on the feathers of the entire plumage. This wash is most pronounced on head, neck, breast, and back. Following are measurements of the skins examined: —

No.		*Sex*	*Wing*	*Tail*	*Exposed Culmen*	*Tarsus*
U. S. N. M.	212,379	♂	103.5	61.0	18.0	31.0
"	212,380	♂	98.0	54.0	17.0	29.0
"	212,381	♂ ?	102.0	55.0	17.0	30.0
"	212,382	♀	98.0	58.0	17.0	31.0
"	212,383	♀ ?	98.0	55.5	17.0	28.5
"	212,384	♀	97.0	54.5	17.0	29.5

Oberholser (Bull. 98 U. S. N. M., 1917, p. 58, 59) has recently pointed out the distinctions between the genus Lamprocorax Bonaparte and Aplonis Gould, showing that in the former group the second primary (counting from the outside, and beginning with the spurious primary) is longer than the fifth, while in Aplonis the second primary is sometimes equal to but usually shorter than the fifth. *Aplonis brunnescens* was not included in his list of species studied in this connection, but upon examination is found to have the second primary shorter than the fifth so that this species is a true Aplonis. *Aplonis cinerascens* Hartlaub and Finsch also belongs here, as it has the more rounded wing found in this group.

81. Aplonis opaca (Kittlitz).

Lamproth[*ornis*] *opaca* Kittlitz, Kupfertafeln naturgesch. Vögel, 1833, **2**, p. 11, pl. 15, fig. 2. (Marianne and Caroline Islands).

Nine specimens of this bird were secured in the Caroline Islands. Four males and one female were taken on Kusaie, 8 February, one male on Ponapé, 11 February, and a female on Uala in the Truk Group, 16 February. In addition an alcoholic specimen (preserved now as a mummy) was taken on Kusaie 9 February, and there are two skins marked from the Caroline Islands with no definite locality given.

These birds all seem to be immature, and none show iridescence on the feathers to any great degree. These specimens average smaller than a series from Guam in the collection of the U. S. N. M., but as immature birds in the same stage of plumage are lacking from the Ladrone Islands specimens from the two localities are not directly comparable. Oberholser (Bull. 98 U. S. N. M., 1917, p. 59) has shown that the name *Lamprothornis opaca* given by Kittlitz as a manuscript name of Lichtenstein is available for this present species.

Measurements of the specimens from the Caroline Islands follow: —

No.	*Sex*	*Locality*	*Wing*	*Tail*	*Exposed Culmen*	*Tarsus*
U. S. N. M. 212,363	♂	Ponapé	121.0	84.0	23.5	31.0
“ 212,364	♂	Kusiae	111.0	——	21.5	28.5
“ 212,365	♂	“	116.0	74.5	21.0	30.5
“ 212,366	♂	“	121.5	79.0	22.5	30.5
“ 212,368	♂	“	123.5	81.5	23.0	30.0
“ 212,362	♀	Uala	116.5	66.0	20.5	31.5
“ 212,367	♀	Kusaie	121.0	75.0	21.0	30.0

MELIPHAGIDAE.

82. Myzomela rubratra rubratra (Lesson).

Cinnyris rubrater Lesson, Dict. sci. nat., 1827, **50**, p. 30. (“Oualan”).

Four males, three females, and an immature bird secured on Kusaie in the Middle Carolines, 8, 9 February were made into skins and in addition eight birds were preserved as mummies. Males and females are similar in color, but the latter have the wings and tail somewhat shorter. Adults seem to vary in depth of color with age. The immature bird is dull black above and brownish below while red feathers are beginning to show on the back and about the head.

Two male birds secured on Uala, 16 February, are not quite typical of this form. The red of the plumage is slightly paler, approaching *M. r. dichromata* from Ponapé. As these specimens from Uala agree otherwise with the large series from Kusaie they are placed with that form for the present. With a larger series more striking differences may be apparent.

Cinnyris rubrater of Lesson is usually quoted as from Voy. Coq. 1826, p. 678. According to Sherborn and Woodward (Ann. mag. nat. hist., 1901, ser. 7, **7**, p. 391) Voy. Coq., **1**, pt. 2, p. 678, should date from 1830. This makes the first reference date from the Dictionnaire des science naturelles, **50**, p. 30, as this volume appeared in 1827. The description there given is practically identical with that appearing under the later reference. In his description Lesson says, "cette espéce, qui existe au Muséum d'histoire naturelle, habite les îles Philipines, où l'a trouvée M. Dussumier, et l'île d'*Oualan*, où j'en ai tué un grand nombre d'individus." In assigning it to the Philippines Lesson was in error as the species is confined to the Ladrone, Pelew, and Caroline Islands. His statement may have basis in the fact that vessels proceeding to the Philippines in the old days usually touched at Guam, so that M. Dussumier may have seen and collected the species there. From this Lesson may have attributed statements or specimens emanating from M. Dussumier to the Philippine Islands, as it was there that that naturalist carried on the major part of his work. The type-locality must stand as Ualan (known now as Kusaie) from which the large series in the present collection came.

83. MYZOMELA RUBRATA DICHROMATA, subsp. nov.

Characters.— Similar to *Myzomela rubrata rubrata* (Lesson) but black markings of head deeper in color and more extensive, covering orbital ring, lower eyelids, antorbital and loral region, and extending around the base of the bill on forehead and chin, red of plumage slightly paler.

Type.— U. S. N. M. 212,413. Adult male. Polynesia: Eastern Caroline Islands; Ponapé, 11 February, 1900. C. H. Townsend.

Description.— Wings, scapulars, a broken band across shoulders, tail, thighs, under wing coverts, lores, antorbital region, orbital ring, lower eyelids and anterior portion of forehead and chin black, the latter connecting with the loral region so that there is a continuous ring of black around the bill; under tail coverts and lower abdomen slightly duller black; rest of plumage including most of head, back, tips to some of scapulars, upper tail coverts, throat, breast, and upper abdomen between scarlet-red and scarlet.

Measurements.— Males (two specimens) wing 76.0–79.0; tail 50.0–52.5; exposed culmen 18.0–18.5; tarsus 22.0.

Female (one specimen) wing 70.0; tail 45.0, exposed culmen 16.0; tarsus 20.5.

Range.— Island of Ponapé, Eastern Caroline Islands, Polynesia.

Remarks.— An adult and an immature male, an immature female, and an adult specimen preserved as a mummy were collected on Ponapé in the Eastern Carolines, 11, 12 February. This form, though paler than *Myzomela r. rubrata* (Lesson) from Kusiae, the type-locality, has the red in its plumage darker than the color found in *Myzomela r. saffordi* Wetmore (Proc. Biol. soc. Washington, 1917, **30**, p. 117) from Guam. The immature plumages show nothing remarkable.

The recognized forms of the red and black honey-eaters with their ranges as known at present are as follows:—

MYZOMELA RUBRATA RUBRATA (Lesson). Kusaie, Uala (not typical). This form probably occurs elsewhere in the Middle and Eastern Carolines.

MYZOMELA RUBRATA DICHROMATA, Wetmore. Ponapé.

MYZOMELA RUBRATA SAFFORDI Wetmore. Guam, Saipan (specimens from other islands in the Ladrone Group not seen).

84. MYZOMELA NIGRIVENTRIS Peale.

Myzomela nigriventris Peale, U. S. explor. exped., 1848, **8**, p. 150. (Samoan Islands).

One bird, an adult, from Upolu, Samoan Islands, with date of collection not marked was preserved as a mummy. Gadow (Cat. birds Brit. mus., 1884, **9**, p. 130) indicates that *Myzomela nigriventris* is a subspecies of *M. cardinalis.* The material at hand is not adequate for proper comparison, in default of which *M. nigriventris* is for the present accorded the rank of a species.

85. MYZOMELA JUGULARIS Peale.

Myzomela jugularis Peale, U. S. explor. exped., 1848, **8**, p. 150. (Feejee Islands).

Three males and one other specimen with sex not marked were secured on Kambara, 7 December, and two mummies taken 16 December, were preserved from Viti Levu. Both localities are in the Fiji Group. Birds from Kambara are slightly larger than specimens from other localities, but the series available is too small to show reliable differences between insular forms.

Measurements of specimens with sex indicated are as follows:—

No.	*Sex*	*Locality*	*Wing*	*Tail*	*Exposed Culmen*	*Tarsus*
M. C. Z. 81,987 (U. S. N. M. 212,420)	♂	Kambara	58.0	38.0	16.5	17.0
" 212,421	♂	"	60.0	37.0	16.5	17.5
M. C. Z. 81,988 (" 212,422)	♂	"	60.0	39.0	17.0	17.5

86. MELIPHAGA CARUNCULATA (Gmelin).

Certhia carunculata Gmelin, Syst. nat., 1788, **1**, pt. 1, p. 472. (Tongatabu).

Eleven specimens of this species were collected. The localities and dates of collection are as follows:— two males, one female, and one bird with sex not indicated from Eua, 28 November; two males from Tongatabu, 30 November; three males and one female from Nomuka, 2 December, all from the Tonga Group, and an immature bird from Upolu, Samoan Islands, with sex and date not marked. The specimens from the Tonga Islands seem very uniform. Birds from Nomuka are slightly larger than the others, though in very worn plumage. Two specimens from Eua are immature birds in fresh bright plumage. The specimen from Upolu is not yet fully grown. In it the cheek wattles are small, and the head is paler than in others.

Measurements of these birds follow:—

No.	*Sex*	*Locality*	*Wing*	*Tail*	*Exposed Culmen*	*Tarsus*
U. S. N. M. 212,388	♂	Eua	100.0	85.0	23.0	32.0
" 212,389	♂ im.	"	100.5	84.5	23.5	31.0
" 212,394	♂	Tongatabu	103.5	88.0	25.0	32.5
" 212,395	♂	"	100.5	84.0	——	31.5
" 212,390	♂	Nomuka	105.5	88.0	23.0	30.0
" 212,392	♂	"	105.0	85.0	23.5	30.0
" 212,393	♂	"	108.0	86.5	23.5	31.0
" 212,386	♀	Eua	94.0	78.5	21.0	29.5
" 212,391	♀	Nomuka	92.5	75.5	21.0	28.0

87. Meliphaga procerior (Finsch and Hartlaub).

Ptilotis procerior Finsch and Hartlaub, Beitr. fauna Central-Polynesiens, 1867, p. 62, pl. 5, fig. 1. (Ovalau).

Four specimens were secured on Viti Levu in the Fiji Islands. One is a male, another is marked male with a query, and on the labels of the other two birds the sex is not indicated. An immature bird not yet fully grown has the bare malar space much reduced in size, and the black markings about the head are duller, but otherwise the bird is similar to adults. Wiglesworth (Aves Polynesiae, 1891, p. 34–35) has divided this species into several subspecies of which these birds should represent the typical form. As other specimens are not available for comparison no attempt is made here to distinguish between forms from the various islands.

Measurements of three adults follow:—

No.	*Sex*	*Wing*	*Tail*	*Exposed Culmen*	*Tarsus*
U. S. N. M. 212,397	♂	94.5	79.5	25.5	29.0
" 212,398	♂ ?	95.0	79.5	24.0	29.0
" 212,399	?	100.0	82.5	24.5	30.0

ZOSTEROPIDAE.

88. Zosterops semperi owstoni Hartert.

Zosterops semperi owstoni Hartert, Nov. zool., 1900, **7**, p. 2. (Ruk).

Four females of this species were secured at Uala in the Truk Group, Middle Carolines, 16 February. These vary somewhat in the depth of black on the lores and under the eye, but this may be due to age. The ear coverts are only slightly paler than the crown. Measurements of these specimens are as follows:—

No.	*Sex*	*Wing*	*Tail*	*Exposed Culmen*	*Tarsus*
U. S. N. M. 212,429	♀	53.0	35.6	9.5	19.0
" 212,430	♀	52.3	35.6	10.4	20.0
" 212,431	♀	54.3	36.0	9.2	19.0
M. C. Z. 81,986 (" 212,432)	♀	54.0	35.2	10.0	20.4

89. ZOSTEROPS FLAVICEPS Peale.

Zosterops flaviceps Peale, U. S. explor. exped., 1848, **8**, p. 95. (Venua-levu).

A single specimen collected on Viti Levu, 16 December, is preserved as a mummy. This bird has been called *Z. flaviceps* provisionally, as specimens of allied races from Australia and elsewhere are not at hand so that it is not possible to settle the true status of this form. It is probable that eventually it may be established as a subspecies of *Z. lateralis* (Latham). The present specimen resembles closely the type of *Z. flaviceps,* which is preserved in the U. S. N. M., and agrees with the description of that form in having the under tail coverts distinctly yellow. It has the following measurements: — wing 56.0; tail 45.0; exposed culmen 12.0; tarsus 18.3.

90. ZOSTEROPS CINEREA (Kittlitz).

Drepanis cinerea Kittlitz, Kupfertafeln naturgesch. Vögel., 1832, **1**, p. 6, pl. 8, fig. 2. (Ualan).

Two males were collected on Kusaie, Eastern Carolines, 9 February. These measure as follows:—

No.	*Wing*	*Tail*	*Exposed culmen*	*Tarsus*
M. C. Z. 81,985 (U. S. N. M. 212,426)	63.0	39.0	13.0	20.5
" 212,427)	62.0	36.2	12.5	20.0

One of these specimens still has the tongue in place. The tip is divided into a number of filaments, all fine, but varying in size, that tend to turn somewhat in slow spirals.

91. ZOSTEROPS PONAPENENSIS Finsch.

Zosterops ponapenensis Finsch, Journ. mus. Godeffroy, 1876, **12**, p. 27, pl. 2, fig. 1. (Ponapé).

One male was collected on Ponapé in the Eastern Carolines, 11 February. Besides being more brownish in coloration this species is smaller than *Z. cinerea.* The bill in particular is shorter. Measurements of this specimen are as follows:— wing 59.2; tail 38.2; exposed culmen 11.0; tarsus 20.0.

Though the plate given by Finsch is marked *ponapensis*, in the original description of this bird the name is given as *Zosterops ponapenensis*.

PLOCEIDAE.

LONCHURA CASTANEOTHORAX (GOULD).

Amadina castaneothorax Gould, Synop. birds Australia, 1837, pt. 2, pl. 21. (Cairns, Queensland).

A bird marked questionably as a female was taken at Tahiti in the Society Islands, 3 October. It has the under tail coverts white with brownish bases. An adult male was secured at Bora Bora in the same group, 17 November. This introduced species does not seem to have been recorded previously.

93. AEGINTHA TEMPORALIS (Latham).

Fringilla temporalis Latham, Ind. ornith. Suppl., 1801, p. xlviii. (New South Wales).

A male was secured at Tahiti, in the Society Islands, 13 November, and two females were collected the following day. This is an introduced form that does not seem to have been recorded here previously.

Bulletin of the Museum of Comparative Zoölogy
AT HARVARD COLLEGE
Vol. LXIII. No. 5.

THE PSAMMOCHARIDAE OF WESTERN NORTH AMERICA.

By Nathan Banks.

CAMBRIDGE, MASS., U. S. A.:
PRINTED FOR THE MUSEUM.
September, 1919.

No. 5.— *The Psammocharidae of Western North America.*

By Nathan Banks.

The Psammocharidae, a family of fossorial Hymenoptera, long known as Pompilidae, are mostly black insects of moderate size; the females are provided with a very painful sting, doubtless as severe as that of any hymenopteron. A few species are large with bright reddish or yellowish wings, others are small, pale colored, but as a rule there is little variation in color. They are very active and not easily taken. Owing to their agility, stinging ability, and dull colors, they have been more neglected by collectors and systematists than other families of fossorial Hymenoptera.

In the past few years I have received collections from Messrs. R. W. Doane, E. P. and M. C. Van Duzee, and especially C. F. Baker; recently a large amount of Western material from Prof. J. Chester Bradley collected mostly by himself. In the M. C. Z. is much material collected by Mr. Henshaw in Washington in 1882.

Compared with the Eastern States the fauna presents more of the Sophropompilus and Aporinellus, and less of Pseudagenia and Priocnemis, but the most notable fact is the absence of red-banded black species. These are very common in the East while I have seen but one from the West (Washington).

Synopsis of Genera.

1. Claws of hind tarsi bent at right angles; antennae situate considerably above the clypeus; labrum exserted for its entire length; metanotum at base bilobed. . . . . *Ceratopales.*
   Claws not bent at right angles. 2
2. A transverse furrow on the second ventral segment (absent in some males); in the fore wings the second discoidal cell at base is right-angled, and without a distinct pocket. 3
   No such furrow on the venter; in fore wings the second discoidal cell has a small pocket at base, the hind tibiae never serrate, always more or less irregularly spined. 8
3. Hind tibiae without spines or only very weak ones, never serrate; in hind wings the transverse median vein ends before the cubitus; last tarsal joint without spines beneath. 4
   Hind tibiae more or less serrately spined, if (male) nearly smooth, then the transverse median vein of hind wings is not before the cubitus. 5

4. Metanotum with erect hair above .... *Pseudagenia.*
Metanotum without erect hair above .... *Ageniella.*
5. Last joint of hind tarsus without spines beneath .... *Priocnemis.*
Last joint of hind tarsus with distinct spines beneath 6
6. In the fore wings the first recurrent vein meets the second submarginal cell before or at the basal third .... *Pepsis.*
In the fore wings the first recurrent vein meets the second submarginal cell beyond the basal third 7
7. First recurrent vein meets the second submarginal cell close to the tip of that cell .... *Mygnimia.*
First recurrent vein meets the second submarginal cell near the middle. *Cryptocheilus.*
8. Pronotum longer than the mesonotum, nearly flat above, scarcely arched longitudinally, last joint of hind tarsus without spines beneath, tarsus I of female without comb of spines 9
Pronotum shorter than the mesonotum, plainly arched longitudinally. 11
9. With two submarginal cells .... *Planiceps.*
With three submarginal cells 10
10. Transverse vein in fore wings sloping backwards; ocelli placed unusually low .... *Psorthaspis.*
Transverse vein in fore wings normal, as also the ocelli ... *Pedinaspis.*
11. Basal abdominal segment with appressed pubescence different from that on the other segments .... *Episyron.*
Without such pubescence 12
12. Metanotum produced angularly at the posterior corners; usually but two submarginal cells .... *Aporinellus.*
Metanotum not so produced; three submarginal cells 13
13. Metanotum transversely striate .... *Ridestus.*
Metanotum not striate 14
14. A short impressed line or groove on posterior part of the pronotum .. 15
No such line or groove 16
15. Metanotum distinctly grooved at base; upper margin of clypeus nearly evenly curved .... *Arachnophroctonus.*
Metanotum not grooved at base; clypeal suture sinuate or zigzag. *Batazonus.*
16. Third joint of antennae of female barely if any longer than the first joint, spines under last joint of hind tarsus very weak 17
Third joint of antennae plainly longer than first 18
17. Metanotum hairy .... *Sophropompilus.*
Metanotum not hairy .... *Nannopompilus.*
18. Third abdominal segment hairy above as well as rest of the body and femora .... *Arachnophila* (Alaska).
Third segment not hairy above 19
19. No spines under last joint of the hind nor front tarsi, clypeus not emarginate, third submarginal cell not petiolate 20
Distinct spines under last joint of the hind tarsi; no malar space 22

20. A distinct malar space between eyes and base of mandibles..........21
No such space; metanotum not hairy..................*Gymnochares.*
21. A comb to front tarsi of female; metanotum oblique; small species. *Agenoideus.*
No comb; metanotum flat at base; larger black species..*Allocyphonyx.*
22. Clypeus of female strongly emarginate in middle; pronotum arcuate behind; a comb to front tarsi.....................*Lophopompilus*
Clypeus not emarginate...23
23. A strong comb to front tarsus of female; metanotum hairy above. *Psammochares.*
No comb to front tarsus..24
24. Metanotum not hairy above; marginal cell much more than its length from tip of the wing..............................*Pompiloides.*
Metanotum plainly hairy above; marginal cell more acute at tip, and nearer to wing tip................................*Anoplius.*

LOPHOPOMPILUS.

♀

Four long spines in comb on first tarsal joint.....................*cleora.*
Three rather short spines, hardly forming a comb on first tarsal joint..*aethiops.*

LOPHOPOMPILUS AETHIOPS (Cresson).

Calif.: Exeter, 30 July; Washington (Kincaid).

LOPHOPOMPILUS CLEORA Banks.

Calif.: Dyerville, July, Los Angeles, 3 May; Wash.: Camp Umatilla, 26 June, 1882.

PSAMMOCHARES.

♀

1. Pronotum arcuate behind; three spines in tarsal comb on first joint; larger species...............................*bellicosus.*
Pronotum angulate behind...2
2. With three spines on first tarsal joint in the comb.............*eureka.*
With four spines on first tarsal joint..............................3
3. Spines of comb on second joint longer than that joint..........*scelestus.*
Spines of comb on second joint shorter than that joint.........*anoplinus.*

♂

1. Pronotum arcuate behind, large species.................... *bellicosus.*
   Pronotum angulate behind.................................... 2
2. Ventral segments with tufts on last two...................... *eureka.*
   No tufts of hair on ventral segments...................... *scelestus.*

PSAMMOCHARES ANOPLINUS, sp. nov.

Type.— Cornell Univ. Coll. *Paratype* M. C. Z. 10,396.
Alberta: Medicine Lake to Jasper, 4 July (Bradley); Calif.: Lake Tahoe, 6,200 ft., 21 August, (Bradley); Oregon: Umatilla, 24 June, 1882.

♀ Black, similar to *P. scelestus* in nearly all respects; in hind tarsi the fourth joint is a little longer than in *P. scelestus*, being nearly equal to the fifth; in the fore wings the basal vein is plainly a little before the transverse. The anterior tarsus has the comb of very much shorter spines than in *P. scelestus*, the two on the second joint hardly half as long as those in *P. scelestus;* there are four short ones on the first joint, all these spines are rather stout and a trifle curved.

Length 11 mm.

PSAMMOCHARES EUREKA, sp. nov.

Type.— M. C. Z. 10,397. *Paratype.*— Cornell Univ. Coll.
Calif.: Lincoln Park, San Francisco (Giffard), Ingleside, 26 August (Bradley), Felton, Santa Cruz Mts., 15–20 May (Bradley), Lakeside, 8 May (Bradley).

♀ Black, densely long haired; clypeus broad, truncate in front, slightly margined; first joint of antennae with hair beneath, third joint quite long, second and third together equal to vertex width, groove above antennae to anterior ocellus, hind ocelli about as close to eyes as to each other, vertex from in front straight across; pronotum angulate behind; metanotum with a median groove, not very deep; legs moderately long, not very spiny, hind tibiae with only about four above, inner spur of hind tibia reaches little beyond middle of the basitarsus, three spines in comb of the first tarsal joint, the last not equal to next joint. Wings violaceous black, marginal cell hardly its length from wing tip, second and third submarginal cell subequal, both broad above, second recurrent reaching cell before the middle, basal vein a little before the transverse. Male more slender, and much smaller; the last two ventral segments before the tip have dense brushes of erect hair; the ventral plate is densely clothed with short hairs, and without the prominent carina of *P. scelestus*.

Length ♀, 9 mm.

PSAMMOCHARES SCELESTUS (Cresson).

Washington (Kincaid); Calif.: Sequoia National Park, 21–25 July, Los Gatos Divide to Mt. Diabolo, 6–8 June, Lemoncove, Tulare Co., 9 July, Mesa Grande, Russian River, 30 September, Harris, Humboldt Co., 29 June, Three Rivers, Tulare Co., 16 July, Ingleside, 25 August.

PSAMMOCHARES BELLICOSUS Banks.

Calif.: Claremont, Harris, Humboldt Co., 29 June; Wash.: Ainsworth, Camp Umatilla, Yakima River, Wenas Valley, June, July, 1882.

ANOPLIUS.

♀

1. Claw with tooth sloping toward tip of the claw, third joint of antennae very long; third submarginal cell not petiolate..............*selkirkensis.*
   Claw with an erect tooth, smaller..................................2
2. Third submarginal cell petiolate; abdomen elongate.........*compactus.*
   Third cell not petiolate..3
3. Fourth joint of hind tarsus nearly as long as the fifth, latter much shorter than the third..*tarsatus.*
   Fourth joint of hind tarsus plainly shorter than fifth, which is subequal to the third...*luctuosus.*

♂

1. Third submarginal cell petiolate, the abdomen more elongate..*compactus.*
   Third cell not petiolate..2
2. The ventral plate with the carina of even height throughout or nearly so. *selkirkensis.*
   The ventral plate with the carina very strong on basal part, and then suddenly sloping behind.................................*luctuosus.*

Anoplius luctuosus (Cresson).

B. Col.: Revelstoke, Selkirk Mts., 30 June, Carbonate, Columbia River, 7–12 July; Oregon: Corvallis; Calif.: Ingleside, 25 August, Ukiah, Mendocino Co., 30 September; Wash.: Wenas Valley, Yakima River, July, 1882.

Anoplius compactus (Provancher).

B. Col.: Glacier, Downie Creek, Selkirk Mts., 9 August; Calif.: Sequoia National Park, 21–25 July.

Anoplius selkirkensis, sp. nov.

Type.— Cornell Univ. Coll. *Paratype.*— M. C. Z. 10,398.

B. Col.: Downie Creek, Selkirk Mts., 14 August (Bradley).

♀ Black; densely long hairy; clypeus broad, truncate in front; no hair under first joint of antennae, third joint very long, with the second fully equal to vertex width; a groove above the antennae; hind ocelli closer to each other than to the eyes; vertex slightly convex from in front; hind margin of pronotum angulate; metanotum with a median groove; abdomen not depressed, venter and tip hairy; legs slender, spines short, those at tip of hind tibia not one half diameter of the joint; inner spur of hind tibia a little more than one half of the basitarsus; claws long, with a large tooth directed toward tip of claw (not at right angles as in most species); last joint of hind tarsus with stout spines beneath, wings dark, darker toward tips, the basal vein nearly interstitial with the transverse, marginal cell hardly its length from wing-tip, second and third submarginal cells subequal, the latter narrowed above, the recurrents end beyond middle of the cells.

Length 9 mm.

The male is much smaller, more slender, more sericeous on face and thorax, and without ventral tufts of hair.

Distinct from other western species by longer third antennal joint, and the sloping tooth of the claws.

Anoplius tarsatus, sp. nov.

Type.— Cornell Univ. Coll. *Paratype.*— M. C. Z. 10,399.

Calif.: Sherwood, Mendocino Co., 1 July, Sugar Pine, Madera Co., 4,300–5,000 ft., August (Bradley).

♀ Blue-black; rather densely clothed with long hair, none below first joint of antennae; clypeus broad, truncate in front; groove above antennae, second and third antennal joints together fully equal vertex width; vertex, from in front, nearly straight across; hind ocelli rather nearer each other than to the eyes; pronotum angulate behind; metanotum without distinct groove; abdomen hairy on basal segment, at tip and beneath; legs long, spines moderately stout, those near tip of hind tibia fully one half the diameter of the joint, inner spur of hind tibia about three fifths of basitarsus; in the hind tarsus the fourth joint is nearly as long as the fifth, and the third is much longer than the fifth. Wings violaceous black, basal vein plainly before the transverse, marginal cell slightly more than its length from wing-tip, second and third submarginals subequal, the third much narrowed above, the second recurrent bowed outward, reaching the third submarginal cell just beyond middle.

The claws are as usual in the genus, a small erect tooth near middle.

Length 10 mm.

In appearance this is much like A. *fulgidus*, but the fourth joint of hind tarsus is much shorter in that species, the tooth on claw is nearer to the tip of claw, and the basal vein is nearly interstitial with the transverse.

POMPILOIDES.

1. The second discoidal cell hardly longer than broad; small species......4
   The second discoidal cell plainly longer than broad..................2
2. Third submarginal cell broad above..........................*elsinore.*
   Third submarginal cell petiolate or nearly so.......................3
3. Female venter hairy; ♂ inner spur hind tibia three fourths of the basitarsus; in genitalia the lateral lobes of basal piece reach much beyond the cleft median lobe....................................*clystera.*
   Female venter smooth; ♂ inner spur hind tibia about two thirds of the basitarsus; in genitalia the lateral lobes of basal piece scarcely reach beyond the emarginate median lobe......................*estellina.*
4. Abdomen wholly black; second submarginal cell subtriangular..*angularis.*
   Abdomen with red spots near base; second submarginal cell trapezoidal. *hageni.*

POMPILOIDES HAGENI, sp. nov.

Type.— M. C. Z. 10,400.

Mont.: Weeksville, 2 August, 1882; Wash.: Camp Umatilla, 26 June, 1882.

♀ Black; abdomen with rufous above on apical part of the second segment and basal part of the third segment; wings brown; tips of the antennae and the tarsi brown. General shape of *P. marginatus*. Third joint of antennae elongate, much longer than fourth. Vertex, seen from in front, slightly convex; hind ocelli about as close to eyes as to each other. Pronotum angulate behind. Legs rather strongly spined; inner spur of hind tibia about two thirds of basitarsus. In the wings the marginal cell is nearly twice its length from apex of wing; the second submarginal cell trapezoidal, with sides of equal length, the third subtriangular, receiving the second recurrent vein beyond the middle.

Length 9 mm.

POMPILOIDES CLYSTERA Banks.

Calif.: Santa Cruz Island, 27 July, Lemoncove, Tulare Co., 9–11 July, Sugar Pine, Madera Co., 24–31 August, Jacintos Barranca, near Coalinga, Fresno Co., 4 June, Sisson, 14 August, Coyote Creek, Tulare Co., 26 June (Stanford Univ. Coll.).

POMPILOIDES ESTELLINA Banks.

Calif.: San Diego Co., 24 May (E. P. Van Duzee).

POMPILOIDES ANGULARIS Banks.

Calif.: Ukiah, Mendocino Co., 30 September, Ingleside, 25 August, Claremont.

POMPILOIDES ELSINORE, sp. nov.

Type.— Cornell Univ. Coll. *Paratype.*— M. C. Z. 10,401.

B. Col.: Carbonate, Columbia River, 2,600 feet, 7–12 July (Bradley).

♀ Black; head and venter with fine short hairs; clypeus truncate in front, almost concave; faint line from antennae to anterior ocellus, hind ocelli nearer to each other than to the eyes; antennae not very long, third joint much longer than first, but barely longer than fourth, the second and third together not as long as vertex width; vertex from in front nearly straight across; pronotum angulate behind; metanotum short, with a median groove;

abdomen rather short; legs of moderate length, with many stout spines, inner spur of hind tibia two thirds of the basitarsus, fourth joint of hind tarsus plainly shorter than the fifth, front tarsus with very short spines, second joint with only one at tip. Wings pale, darker on tips, the marginal cell rather long, second submarginal nearly quadrate, third about as large, but little narrowed above, other veins about as usual. The male has the inner spur of hind tibia broader than usual.

Length 8 mm.

NANNOPOMPILUS.

Bluish or greenish; body short; male shows a short basal piece to genitalia with an angulate cleft, the ventral plate carinate .... *padrinus*.
Blackish; body more slender; the male shows a long slit with sinuous edges, the ventral plate not carinate .... *consimilis*.
Blackish, basal part of abdomen more or less reddish .... *rufibasis*.

NANNOPOMPILUS PADRINUS (Viereck).

Calif.: Claremont, Ukiah, Mendocino Co., 30 September, Ingleside, 25 July.

NANNOPOMPILUS RUFIBASIS (Banks).

Wash.: Olympia (Kincaid), agreeing with eastern specimens.

NANNOPOMPILUS CONSIMILIS (Banks).

Wash.: Wenas Valley, Yakima River, July, 1882; Oregon: The Dalles, 23 June, 1882.

SOPHROPOMPILUS.

♀

1. Legs noticeably hairy; four comb spines on first tarsal joint 2
   Legs barely hairy 3
2. Tibiae with long hairs, and a few on tarsi .... *bradleyi*.
   Few if any hairs on tibiae .... *tumifrons*.
3. Pronotum slightly but distinctly angulate behind .... *subangulatus*.
   Pronotum broadly arcuate behind .... *parvus*.

♂

1. Head tumid about ocelli, and above the antennae; femora hairy. *tumifrons.*
   Head not tumid at ocelli; femora not noticeably hairy................2
2. Pronotum arcuate behind; posterior slope of metanotum silvery pubescent. *parvus.*
   Pronotum angulate behind; posterior slope of metanotum not silvery pubescent.......................................*subangulatus.*

SOPHROPOMPILUS BRADLEYI, sp. nov.

Type.— Cornell Univ. Coll.

Calif.: Giant Forest, Sequoia National Park, 6,000–7,000 ft., 21–26 July (Bradley). One ♀.

♀ Bluish, legs and antennae more black; wings not very dark, not darker at tip; body and legs densely long haired, even down on the first and second tarsal joints, most of the hairs erect, and very long. Head rather broad, clypeus truncate in front, margined, a distinct groove from antennae to anterior ocellus, hind ocelli nearer to each other than to the eyes; vertex from in front slightly convex; antennae short and heavy, third joint as long as first; pronotum broadly arcuate behind, metanotum short, rounded, with a median groove; abdomen moderately elongate, hardly depressed, hairy all over, those at the tip no longer than elsewhere; legs rather short, with numerous stout spines; tarsal comb of four heavy curved spines on the first joint, the last of which is longer than the next joint; inner spur of hind tibia two thirds of basitarsus; wings with marginal cell length from the tip, second submarginal cell nearly square, receiving the first recurrent vein near tip, the third submarginal cell short, narrowed above, receiving the second recurrent vein near its middle; basal vein bowed, a little before the transverse, in hind wings cubital fork interstitial with the end of the cell.

Length 10 mm.

SOPHROPOMPILUS PARVUS (Cresson).

Calif.: Ingleside, 25 July, Sequoia National Park, 21–26 July; B. Col.: Carbonate, Columbia River, 7–12 July; Wash.: Yakima, and Wenas Valleys, July, 1882.

SOPHROPOMPILUS TUMIFRONS Banks.

Calif.: San Diego Co., 14 June.

SOPHROPOMPILUS SUBANGULATUS, sp. nov.

Type.— Cornell Univ. Coll. *Paratype.*— M. C. Z. 10,402.

Colo.: Tabernash, August (Tucker Coll.); Calif.: Ingleside, 23–26 August (Bradley); B. Col.: Beaver Mouth, Selkirk Mts., 16–20 August (Bradley).

♀ Black, abdomen bluish, similar to *S. ingenuus* in most respects, but much smaller, body not very hairy, the femora show no hairs, third joint of antennae about equal first, pronotum slightly but plainly angulate behind, metanotum with a deep median groove; inner spur of hind tibia nearly two thirds of basitarsus; the tarsal comb has the last spine of the first joint longer than the next joint, and the basal two not half their length apart (in *ingenuus* the last is not as long as next joint, and the basal two farther apart). Wings dark, but paler before the basal vein, venation about as in *S. ingenuus.*

Length 8 to 10 mm.

Differs from *S. ingenuus* by longer tarsal comb, and angulate pronotum. It differs from *S. parvus* in larger size; distinctly angulate pronotum, and in a much longer comb on female tarsi.

AGENOIDEUS.

But one species known which occurs across the northern part of North America.

AGENOIDEUS HUMILIS (Cresson).

B. Col.: Revelstoke, Selkirk Mts., 8–13 July.

GYMNOCHARES.

Two species known, the Arizonian one extending into California.

GYMNOCHARES BIEDERMANNI (Banks).

Calif.: Claremont (Baker).

ARACHNOPHROCTONUS.

1. Body uniformly yellowish.................................*unicolor.*
   Body more or less marked with brown or reddish brown....*ferrugineus.*

Arachnophroctonus unicolor Viereck.

Calif.: Lemoncove, Tulare Co., 9–11 July, Dulzura, San Diego Co., 15 August, Three Rivers, Tulare Co.; Wash.: Wenas Valley, 6 July, 1882.

Arachnophroctonus ferrugineus (Cresson).

Calif.: Claremont, National City, 15 May.

Aporinellus.

1. Legs partly reddish.................................*californicus.*
Legs all black...2
2. Abdomen (except last two segments) wholly sericeous........*completus.*
Abdomen black with sericeous bands or spots........................3
3. Abdomen with complete silvery bands across apex of each segment above. *apicatus.*
Abdomen without complete bands...............................4
4. Pronotum and pleura noticeably marked with silvery; wings dark at tips. *intermedius.*
Pronotum and pleura not noticeably marked with sericeous; wings nearly uniformly blackish..................................*medianus.*

Aporinellus californicus Rohwer.

Calif.: Alameda Co.

Aporinellus completus Banks.

Wash.: Yakima River, Kittitas Valley, June, July, 1882.

Aporinellus apicatus Banks.

Calif.: National City, 15 May, Felton, Santa Cruz Mts., 20–25 May, Berkeley, 16 September.

Aporinellus medianus Banks.

Calif.: Ramona, 15 August, Los Angeles, May, Sequoia National Park, 6 August, Lemoncove, Tulare Co., 9 July, El Cajon.

APORINELLUS INTERMEDIUS, sp. nov.

Type.— Cornell Univ. Coll. *Paratype.*— M. C. Z. 10,403.
Calif.: Claremont (Baker), Owen's River, 5 August (Kennedy).

♀ Black; marked with sericeous as follows: — most of face, back of head, front of coxae, outer sides of femora and tibiae, pleura, part of the pronotum, its posterior margin very strongly so, a mark on sides of the scutellum, at apex of metanotum, and large subtriangular median spots at apex of first, second, and third abdominal segments above. Wing not very dark, but beyond the stigma it is black. Body rather heavy, but vertex not as broad as in *laticeps;* antennae longer than in that species, the second plus third joints equal vertex width; pronotum arcuate behind; inner spur of hind tibia a little more than one half the basitarsus; two or three submarginals, the third being extremely small, if present, second recurrent vein received near apex of second or at middle of third cell.

Length 7 mm.

Differs from *A. laticeps* in having the marks on abdomen triangular (instead of complete bands), and in longer antennae; it differs from *A. medianus* by the wings being dark only at tip, the sericeous marks on thorax, and in having much longer spines in the comb of front legs.

EPISYRON CALIFORNICUS Banks.

Calif.: Ingleside, 25 August, Fresno, May 5, Three Rivers, Tulare Co., 16 July, Felton, Santa Cruz Mts., 15–19 May, Claremont; B. Col.: Revelstoke, Selkirk Mts., 4–6 July (Bradley).

RIDESTUS STRIATULUS Banks.

"Calif." (Cornell Univ. Coll.).

PSORTHASPIS PLANATUS (Fox).

Calif.: Laguna Beach, Lemoncove, Tulare Co., 16 May, San Diego, 14 June.

PLANICEPS.

1. Legs not noticeably hairy, metanotum not hairy................*luxus.*
   At least front femora and tibiae hairy............................2
2. All femora and tibiae plainly hairy........................*hirsutus.*
   Only front femora and tibiae hairy...........................*assimilis.*

PLANICEPS LUXUS Banks.

Calif.: Washington (Kincaid), Claremont, Ingleside, August, National City, 15 May, Santa Clara Co., May; Wash.: Yakima Valley, 16 July, 1882.

PLANICEPS HIRSUTUS Banks.

Calif.: Mountains near Claremont, Pasadena, Ingleside, 26 May.

PLANICEPS ASSIMILIS Banks.

B. Col.: Penicton, 11 August, Peachland, 24 August; Calif.: Samoa Beach, Humboldt Co., 28 June.

AGENIELLA.

♂

1. Body mostly yellowish, legs wholly so 2
   Body mostly black (at least head and thorax) 3
2. Wings uniformly deep black; larger species . . . . *coronata.*
   Wings paler, darker on tips and over basal vein; smaller species. *blaisdelli.*
3. Third submarginal cell as high as long 4
   Third submarginal cell plainly longer than high 5
4. Basal segment of abdomen slender, fully three times as long as wide at tip, slightly margined below . . . . *subaequalis.*
   Basal segment of abdomen not twice as long as broad at tip . . . . *aequalis.*
5. Basal segment of abdomen about twice as long as broad at tip; wings nearly uniformly brown; apical segment pale . . . . *euphorbiae.*
   Basal segment plainly more than twice as long as broad at tip, broadly margined below; wings darker at tips 6
6. Abdomen basally red; legs mostly pale; mid and front spurs white. *partita.*
   Abdomen black, apical segment white; mid spurs black, legs mostly black. *praestans.*

AGENIELLA CORONATA, sp. nov.

Type.— Cornell Univ. Coll. *Paratype.*— M. C. Z. 10,404.

Calif.: Mts. near Claremont (Baker), San Buenaventura, 18 August, Santa Rosa.

Yellowish red as in *A. blaisdelli;* a little black between ocelli, abdomen sometimes darkened (discolored) above near tip; wings violaceous black, uniformly dark throughout in both pairs. Similar to *A. blaisdelli* in structure; the pronotum behind rather angulate; legs weakly spinose; distinguished by its much larger size and uniformly darker wings.

Length 14 mm.

AGENIELLA BLAISDELLI (Fox).

Calif.: Lemoncove, Tulare Co., 9–11 July, Lompoc, 9 September, Mesa Grande, Russian River, 30 September, Glenwood, 27 May, Sugar Pine, Madera Co., 24–31 August.

AGENIELLA EUPHORBIAE (Viereck).

Calif.: Described from San Pedro (T. D. A. Cockerell).

AGENIELLA SUBAEQUALIS, sp. nov.

Type.— Cornell Univ. Coll.
Calif.: Mts. near Claremont (Baker).

♂ Black; tips of mandibles reddish; wings faintly fumose, hardly darker at tip; last segment of abdomen brownish above. Body very slender; face narrowed below, silvery sericeous on the lower part, lateral ocelli a little closer to each other than to the eyes, last joint of the antennae strongly compressed; hind margin of pronotum deeply emarginate behind, pleura and hind part of the metanotum silvery; abdomen very slender, first segment about three times as long as broad at tip, petiolate, slightly margined below toward tip. Spurs rather paler than legs, inner spur of hind tibia a little more than one half of the basitarsus. Wings rather short, marginal cell fully its length from wing-tip, third submarginal plainly higher than long, only slightly narrowed above, basal vein bowed, interstitial with the transverse, second recurrent reaches third submarginal cell beyond the middle.

Length 4 mm.

AGENIELLA AEQUALIS, sp. nov.

Type.— Cornell Univ. Coll.
B. Col.: Revelstoke, Selkirk Mts., 1 July (Bradley).

♂ Black; front tibiae and tarsi brown, spurs brown; tips of mandibles pale; wings uniformly light fumose, not darker on tips. Body slender; face rather broad, nearly as broad below as above, clypeus truncate, lateral ocelli much nearer to each other than to the eyes; posterior margin of the pronotum angulate, metanotum not strongly sericeous; abdomen broad, sessile, first segment hardly one and a half times longer than broad at tip, apical segment with short fine hairs, the inner spur of hind tibia a little more than one half of the basitarsus; third submarginal cell nearly square, but a little higher than long, and scarcely narrowed above, receiving the second recurrent at middle, basal vein bowed, much before the transverse.

Length 5 mm.

AGENIELLA PRAESTANS Banks.

Calif.: Muir Woods, 30 August, Claremont, June.

AGENIELLA PARTITA, sp. nov.

Type.— Cornell Univ. Coll. *Paratype.*— M. C. Z. 10,405.
Calif.: Brawley, Imperial Co., 9 August (Bradley).

♂ Black, basal part of the abdomen mostly reddish or yellowish, apical segment white above, scape beneath, narrow lower margin of clypeus, and the tips of mandibles pale; legs mostly pale, front and mid spurs white; wings pale, darker on tips. Slender; face slightly narrowed below, silvery sericeous, lateral ocelli rather nearer to eyes than to each other, hind border of pronotum broadly arcuate, thorax silvery sericeous, especially pronotum, spot before wings, scutellum, metanotum and two oblique stripes on the pleura. Abdomen slender, basal segment about three times as long as broad at tip, broadly margined below, with a dark stripe above. Front legs, and femora and tibiae of the other pairs pale, the coxae may also be pale below; inner spur of hind tibiae a little more than one half of the basitarsus. Marginal cell not its length from the wing-tip, third submarginal cell much longer than high, narrowed above, receiving the second recurrent vein near middle, basal vein is interstitial with the transverse.

Length 4.5 to 5 mm.

A female from Sugar Pine, Madera Co., Calif. may belong here; it is black with a red abdomen, black legs; but the general structure is similar.

PSEUDAGENIA METALLICA Banks.

Calif.: Ramona, 15 August, Santa Clara Co., May, Blue Lake, Humboldt Co., 20–27 June, Mts. near Claremont (Baker), Claremont; B. Col.: Revelstoke, Selkirk Mts., July; Wash.: Wenas Valley, Yakima River, July, 1882.

PRIOCNEMIS.

1. Wholly black...2
   Abdomen more or less reddish....................................3
2. Metanotum transversely wrinkled; clypeal margin concave....*hesperus.*
   Metanotum not striate or very minutely so; clypeal margin truncate. *pompilus.*
3. Head, thorax, coxae, and femora very hairy, larger species....*comparatus.*
   Thorax, coxae, and femora not noticeably hairy......................4
4. Dark cloud in wing; clypeus all black; inner spur hind tibia one half of basitarsus...*alienatus.*
   No dark cloud in wing; clypeal margin pale; inner spur of hind tibia not one half of the basitarsus................................*placitus.*

PRIOCNEMIS COMPARATUS (Smith).

Washington (Kincaid); Calif.: Blue Lake, Humboldt Co., 20–26 June, Mendocino, San Jose.

PRIOCNEMIS ALIENATUS (Smith).

B. Col.: Revelstoke, Selkirk Mts., 4–6 July.
Eastern specimens do not differ from those from Revelstoke.

PRIOCNEMIS PLACITUS (Banks).

Calif.: Lemoncove, Tulare Co., 7–11 July.

PRIOCNEMIS POMPILUS Cresson.

Washington (Kincaid); Calif.: Felton, Santa Cruz Mts., 15–16 May.

Priocnemis hesperus Banks.

Calif.: Stanford Univ., 3 September.

Cryptocheilus.

1. Wings more or less yellow or reddish 2
   Wings, and antennae black .... *atratus.*
2. Antennae yellowish 3
   Antennae black 4
3. Second recurrent strongly bent; in hind wing the cubitus arises before the end of the cell .... *flammipennis.*
   Second recurrent only slightly curved; in hind wing the cubitus arises beyond the end of the cell .... *pallidipennis.*
4. Abdomen hairy above, femora also very hairy 5
   Abdomen not hairy above except at tip, femora not noticeably hairy. *terminatus.*
5. Metanotum wrinkled on basal part .... *rugosus.*
   Metanotum not wrinkled .... *inaequalis.*

Cryptocheilus terminatus (Say).

Calif.: Claremont, Los Gatos Divide to Mt. Diabolo, 6–8 June, Coalinga, 9 June; Wash.: Yakima River, 30 June, 1882.

Cryptocheilus flammipennis (Say).

Calif.: Lemoncove, Tulare Co., 7–11 June.

Cryptocheilus inaequalis Banks.

Wash.: (Kincaid), Camp Umatilla, 27 June, 1882.

Cryptocheilus pallidipennis (Banks).

Calif.: Brawley, Imperial Co., 9 August.

Cryptocheilus rugosus Banks.

Idaho: Lapwai, 4 August; Wash.: Wawawai, June.

CRYPTOCHEILUS ATRATUS, sp. nov.

Type.— Cornell Univ. Coll. *Paratype.*— M. C. Z. 10,406.
Calif.: Glenwood, 27 May, Lemoncove, Tulare Co., 9–11 July, Harris, Humboldt Co., 29 June, Felton, Santa Cruz Mts., 20–25 May (Bradley).

♀ Deep black, the tarsi more brown, wings violaceous. Body with short hairs, longer on the vertex, tip, and venter of abdomen. Face as broad below as above, clypeus slightly concave below, lateral ocelli very much nearer to each other than to the eyes, vertex, from in front, nearly straight across, third antennal joint one and a half times longer than first, one and a fourth longer than the fourth joint, last joint very slender. Pronotum slightly angulate behind; metanotum transversely striate, most noticeable on the sides. Abdomen slightly depressed, hair at tip rather yellowish brown. Legs slender, mid and hind tibiae with numerous short, but stout spines, inner spur of hind tibia about two fifths of the basitarsus. Wings hardly reaching beyond abdomen; marginal cell nearly its length from wing-tip, second submarginal cell little longer than broad, receiving the first recurrent vein beyond middle, the third submarginal longer than the second, not extending beyond marginal, receiving the second recurrent vein near middle, the latter evenly but not strongly curved, basal vein before the transverse.

Male is much more slender, the pronotum is plainly much longer, suggesting a Pedinaspis, the metanotum is not distinctly striate; the lateral parts of the genitalia are densely black fringed on the outer side.

Length 8 to 14 mm.

Related to *C. idoneus* from North Carolina but latter has the metanotum not plainly striate, less violaceous wings, and slightly different venation.

MYGNIMIA.

1. Second recurrent vein nearly straight across................*hesperina.*
2. Second recurrent vein much curved........................*ustulata.*

MYGNIMIA USTULATA (Dahlbon).

Utah: Salt Lake Co., 30 May; Arizona.

MYGNIMIA HESPERINA Banks.

Calif.: San Diego, Stanford Univ.

Pepsis.

1. Antennae more or less reddish or yellowish................*mildei.*
   Antennae all black..2
2. Wings reddish..................................*cinnabarina.*
   Wings yellowish....................................*formosa.*

Pepsis formosa (Say).

Calif.: San Emigdio Canon, Kern Co., ♂ ♀.

Pepsis cinnabarina Lucas.

Calif.: Claremont, Los Angeles, Kern Co.

Pepsis mildei Stål.

Calif.: Claremont, Pasadena, San Jose, San Luis Obispo.

Ceratopales.

1. Wings black..*nigripes.*
   Wings hyaline..2
2. First abdominal segment almost wholly yellow above.......*stretchi.*
   First abdominal segment black, with two transverse yellow spots, sometimes connected..................................*fraterna.*

Ceratopales nigripes (Cresson).

Recorded from Washington.

Ceratopales fraterna (Smith).

Oreg.: The Dalles, June, 1882; Calif.: Kern Lake, 27 July, Sonoma Co.; Wash.: Yakima River, July, 1882, Wenas Valley, July, 1882.

Ceratopales stretchi (Fox).

Described from "California."

Bulletin of the Museum of Comparative Zoölogy
AT HARVARD COLLEGE.
Vol. LXIII. No. 6.

PACIFIC COAST POLYCHAETA COLLECTED BY ALEXANDER AGASSIZ.

By Ralph V. Chamberlin.

With Three Plates.

CAMBRIDGE, MASS., U. S. A.:
PRINTED FOR THE MUSEUM.
November, 1919.

No. 6.— *Pacific Coast Polychaeta collected by Alexander Agassiz.*

By Ralph V. Chamberlin.

In 1859 and the early part of 1860 a considerable collection of Pacific Coast polychaetes was made by Alexander Agassiz in the intervals of his work as Aid on the U. S. Coast Survey. The greater part of the material was secured at Mendocino and Crescent City, California, which are on a section of the coast scarcely represented in more recent collections of polychaetes. Other specimens were secured at San Mateo, Calif. and on the Gulf of Georgia, Washington, and a few at Panama. This collection, though of much interest and value, has remained unidentified until the present time with the exception of a number of species of Nereis described by Ehlers in his Die Borstenwürmer (1864–1868). The following is a complete list of the species in the collection at present identifiable. In addition to the specimens collected by Mr. Agassiz himself, notes upon some material secured by others on the Pacific Coast during or near the same period of time are also included

Amphinomidae.

1. Notopygos maculatus (Kinberg).

Lirione maculata Kinberg, Öfvers. K. vet. akad. Förh., 1857, **14**, p. 12.

Two large specimens from Panama, one collected by Dr. G. A. Maack on the Darien Expedition and one by C. F. Davis (received M. C. Z. in 1862) are referred to Kinberg's species, the type of which came from the same locality, on the assumption that this type is a very young specimen. Kinberg's account is so meager that, were the present specimens not from the same locality, they would scarcely be referred with much confidence to this species. These specimens are much larger than the type, approaching rather *crinitus* or *splendens* in size. One consists of thirty-three and one of thirty-five segments. The dark maculations and stripes are strongly developed. The Philippine specimens referred by Grube (Annulata Semperiana, 1878, p. 8, pl. 1, fig. 3) to this species are not conspecific with the Panama form, as shown by their much simpler branchiae, different coloration, and other features.

2. EURYTHOE COMPLANATA (Pallas).

Aphrodita complanata Pallas, Misc. zool., 1766, p. 109, pl. 8, fig. 1926.

Numerous specimens of this widespread form from Panama (C. F. Davis, received M. C. Z. in 1862), and Mazattan, Mexico (H. Edwards, received M. C. Z. in 1873).

POLYNOIDAE.

3. HALOSYDNA INSIGNIS (Baird).

Lepidonotus insignis Baird, Proc. Zool. soc. London, 1863, p. 106.

Many deep-colored specimens collected by Mr. Agassiz at Crescent City, in May, 1859. Numerous specimens labeled simply "California, A. Agassiz." A specimen from Sacramento Bay, Calif., was collected by Capt. H. Davis in April, 1859.

4. LEPIDONOTUS CAELORIS Moore.

Proc. Acad. nat. sci. Philad., 1903, p. 412, pl. 23, f. 12.

Polynoe squamatus Johnson (non Linné), Proc. Calif. acad. sci. Zool., 1897, ser. 3, **1**, p. 166, pl. 7, f. 30; Treadwell, Univ. Calif. publ. Zool., **13**, p. 181.

Two specimens San Francisco, Calif. (T. G. Cary) and one Gulf of Georgia, Wash. (A. Agassiz).

HESPERONOE, gen. nov.

Differing from Antinoe in having notopodial setae of two very different forms, the more numerous ones much stouter than the neuropodials and a fine, slender, capillary form. Neuropodials also of two forms, the more slender supraaciculars of the Antinoe type with the long, fine, smooth tips, and the subaciculars mostly stouter and with tips more approaching the Eunoe type. Otherwise agreeing with Antinoe.

GENOTYPE.— *H. senilis*, sp. nov.

5. HESPERONOE SENILIS, sp. nov.

Plate 1, fig. 1–4.

Differing decidedly from *Antinoe macrolepida* Moore, known from the Gulf of Georgia and northward, in having the peaks of the prostomium conspicuously large, pointed, and widely separated. Anterior eyes much smaller than in that species, but little exceeding the posterior. Median tentacle slender, tapered, not more than twice as long as the prostomium measured to anterior ends of peaks; lateral tentacles very much smaller as usual, but little exceed-the ceratophore of the median tentacle and shorter than the prostomium. Prostomium longer than wide. Palpi very long and evenly tapered, much exceeding the median tentacle. Tentacular cirri similar in form to the palpi but shorter and proximally more slender; the inferior one thicker than the dorsal. Body ventrally widest near somite XII, from where it narrows evenly and moderately caudad, proportionately much wider than in *macrolepida*, the ventral width much exceeding the length of parapodia exclusive of cirri and setae. No distinct ventral groove. Nephridial tubercles begining on VII, slender. Elytra overlapping moderately medially and cephalocaudally. Those of first pair circular, the others elliptical; second, third, and fourth pairs broadly and shallowly incurved on anteroectal side, the first of these the most strongly so. Elytra thin, marginally transparent, elsewhere translucent; surface, excepting a narrower border, covered with low, light colored tubercles, each tubercle bearing a dark spinous point; the tubercles not crowded, becoming much smaller on anteroectal part of scale, the posterior ones commonly more or less laterally compressed; edges smooth excepting on external side where there are fine short cilia. Notocirri much exceeding the setae, slenderly and evenly tapered with no subterminal enlargement; cirrophore large. Neurocirri attached distad of middle, slenderly subulate, obviously shorter than the shortest setae. Each ramus of parapodium supported by a single, stout, evenly tapering aciculum, the notopodial stouter than the neuropodial. Notopodial setae numerous but fewer than the neuropodials; the prevalent type shorter but much stouter than the stoutest neuropodials, a few most dorsal ones very short. In addition in the ventral part of the fascicle a number of very fine but longer capillary setae with widely separated teeth along one edge. The supracicular neuropodials are of the Antinoe type, being slender with exceptionally long and fine smooth tips. Of the much more numerous subacicular setae the majority are coarser than the supraciculars with tips notably shorter, approaching more the Eunoe type. Below these a group of much finer setae with shorter heads set at a greater angle to the shaft. The general color of parapodia and body at present light brown, the body above and below with a paler median longitudinal band; elytra greyish or colorless. Last few segments of body of type missing.

Length to caudal end of twelfth elytra 23 mm.; width to tips of setae, 9.5 mm.; to outer edges of elytra, 7.8 mm.; to bases of parapodia ventrally, 3.6 mm.

Locality.— Calif.: San Francisco (A. Agassiz).

Type.— M. C. Z. 179.

6. HARMOTHOE IMBRICATA (Linné).

Aphrodita imbricata Linné, Syst. nat., ed. 12, 1767, 1, p. 1084.

One specimen from San Francisco (T. G. Cary) and one from Crescent City (A. Agassiz). This is a common species on the Pacific Coast from Alaska to San Diego.

APHRODITIDAE.

7. APHRODITA ARMIFERA Moore.

Proc. Acad. nat. sci. Philad., 1910, p. 371, pl. 31, fig. 65, 66, pl. 32, fig. 67–75.

Two specimens of this strongly characterized species were dredged in 22 fathoms of water five miles south of Santa Barbara.

8. APHRODITA LEIOSETA, sp. nov.

This form is close to *A. castanea* Moore, from which it is separated chiefly because of differences in the setae. The upper neurosetae are black, the median ones black or dark brown and the ventrals brown of a usually lighter shade. The neurosetae of the ventral series are from two to five in number, three and four being most common in the middle region of body, as against from six to eight in *castanea*. Three in the middle series and two in the upper as usual. The neurosetae differ from those of *castanea* in being all wholly smooth, with no trace of hairiness at tips, and in being distally more strongly curved, the curvature weakly sigmoidal, with tip less acute, that of the dorsals in particular narrowly rounded. The notosetae are proximally dark or reddish brown but in middle region of length become light and distally colorless. They have the long, soft, slender distal ends characteristic of the *japonica* group though these do not seem to be normally at all hooked. As a whole they are strongly curved and are largely concealed by the felt, the distal portion in all cases normally buried in this. The prostomium is long, somewhat inversely pyriform, being much narrowed proximad; evenly rounded anteriorly, without distinct ocular peduncles. Eyes on dorsal surface, the anterior farther apart than the posterior from which it is separated by about its radius. Median tentacle very short, clavate. Facial ridge remarkably long, much exceeding the prostomium in length, acutely narrowed anteriorly. Elytra large, overlapping in middle line. Dorsal felt abundant and dense, greyish brown, normally involving and dorsally concealing the neurosetae in dorsal view. Number of somites, thirty-seven.

Length of body proper, 33 mm.; length over all, 38 mm. Greatest width to bases of parapodia, 12.5 mm. Width to tips of neurosetae, 24 mm.

Locality.— Calif.: Mendocino (A. Agassiz).

Type.— M. C. Z. 14.

NEPTHYDIDAE.

9. NEPTHYS CAECA (Fabricius).

Nereis caeca Fabr., Fauna Groenlandica, 1780, p. 304.

Two specimens from the Gulf of Georgia, Wash. (A. Agassiz).

NEREIDAE.

10. NEREIS CALIFORNICA Ehlers.

Borstenwürmer, 1868, p. 553, pl. 23, fig. 2.

Ehlers founded this species on a single incomplete specimen taken by Mr. Agassiz at Mendocino. In the collection I find several additional specimens taken at this locality at the same time.

Type.— M. C. Z. 40.

11. NEREIS PROCERA Ehlers.

Borstenwürmer, 1868, p. 557, pl. 23, fig. 2.

Taken in Gulf of Georgia, Wash.

Type.— M. C. Z. 155.

12. NEREIS BRANDTI Malmgren.

Öfvers. K. vet. akad. Förh., 1865, p. 183.

Sacramento Bay (Capt. H. Davis, April, 1859), San Mateo, Calif., and Gulf of Georgia, Wash. (A. Agassiz).

13. NEREIS VEXILLOSA Grube.

Middendorf's Reise nord. u. ost. Siber. Zool., 1851, **2**, th. 1, p. 4, pl. 2, fig. 4, 5, 6.

Mendocino, Crescent City, and San Mateo, Calif., and at the Gulf of Georgia, Wash. (A. Agassiz).

14. NEREIS MENDOCINANA, sp. nov.

Plate **1**, fig. 5.

In this species the notopodia are simple, none at all enlarged into a large lamellar form bearing the cirrus such as occurs in *brandti* and *vexillosa*. The two lobes of the notopodia are equal throughout. In a considerable number of the anterior notopodia the lobes are thick and conical; but caudad they become more slender and thin in the anterocaudal direction, in the posterior region appearing as simple, short triangular processes. Notocirrus attached at base of dorsal lobe, long and slender or filiform. No postsetal lobe in the anterior parapodia but caudad one becomes evident as a low, but broad, distally straight or slightly convex tip. Lower neuropodial lobe conical, nearly the same size as the notopodial lobes, becoming smaller and more slender caudad. Neurocirri arising from swelling at base of neuropodia, slender, surpassing neuropodial lobe. Anterior region of prostomium triangular with anterior end narrowly truncate and bearing the tentacles which are contiguous, subulate, and shorter than the distance between eyes. Eyes large, the posterior eye on each side in line with the anterior or nearly so, smaller. Styles of cirri short, articulated. In the proboscis I is unarmed. Each II bears nine or ten teeth in a double oblique line. V is unarmed. Each VI bears a few denticles in a central area. On each IV there are ten teeth, of which eight or nine form a curved line while one or two lie on the concave side of this. On the ventral side across VII and VIII run several series of denticles of which those of the most anterior series are fewer, more widely separated and much larger than those of the more posterior series. Each maxilla with six teeth. Number of segments, seventy.

Length, 33 mm.; greatest width, exclusive of parapodia, 3 mm.
Locality.— Calif.: Mendocino (A. Agassiz).
Type.— M. C. Z. 2,129.

15. NEREIS AGASSIZI Ehlers.

Borstenwürmer, 1868, p. 542, pl. 23, fig. 1.

Mendocino, Calif. (A. Agassiz).
Type.— M. C. Z. 149.

LEODICIDAE.

16. LEODICE VALENS, sp. nov.

Plate 1, fig. 6–8.

In the type of this species the branchiae begin on somite V and end on somite LXXX on the right side and LXXVIII on the left. The first and second branchiae are simple filaments; the third are bifid with the two filaments equal; the fourth gills, like the succeeding compound ones, unilaterally pectinate, the branches five in number, each forming an acute angle with base. Caudad of this the number of branches increases to a maximum of ten, the branchiae also longer, when laid against dorsum attaining or extending a little beyond the mid-dorsal line. Farther back they again decrease in length and in number of filaments, and the last seven to nine are simple filaments like those of the first two pairs. Anterior border of prostomium emarginate or incised at the middle between bases of palpi. Anterior lateral tentacle on each side inserted cephaloectad of the posterior and directly in front of the eye. Posterior paired tentacle a little farther forward than the median, the bases of all forming a semicircle. Ceratophores extremely low. Style of median tentacle evenly tapered, not constricted between rings which are cylindrical, long, and about twelve in number. Nuchal cirri nearly reaching anterior edge of peristomium; rings eight or nine, not at all moniliform. Mandibles with anterior plates white, anterior margin of each with two incurvings and three rounded teeth or broad crenulations. Left maxilla II with six teeth; the right with eight of which the most caudal are small; the unpaired or mesal left plate with eight (or nine) teeth. Left maxilla III with six teeth, the right with eight. Notocirri mostly flattened subligulate; the anterior ones much larger than the posterior; most not showing any distinct segmentation, but some of the anterior ones more or less divided into a long basal segment and usually three smaller distal ones. Neurocirri all thick, short, subconical, and much exceeded by the setae. Shaft of composite setae strongly enlarged distally. Appendage bidentate, the upper tooth erect, the smaller lower one forming a very obtuse angle with it, and nearly at right angles to the axis of the appendage; guard narrow; length of appendage less than once and a half the diameter of the exposed portion of shaft. General color light brown, branchiae paler; no distinct markings. Anal cirri long, slenderly tapered. Total number of segments one hundred and eighty-one.

Length, 140 mm.; greatest width, 7 mm.
Locality.— Calif.: Mendocino (A. Agassiz).
Type.— M. C. Z. 120. *Paratype.*— 121.

LUMBRINEREIDAE.

17. LUMBRINEREIS ZONATA Johnson.

Proc. Boston soc. nat. hist., 1901, **29**, p. 408, pl. 9, fig. 93–100.

Several small specimens referred to this species differ from typical larger specimens in wholly lacking brown annulations, being uniform yellow of a slight ferruginous tinge. The crochets and setae are relatively longer than in the type but agree in distribution. One immature specimen from Crescent City and several from Mendocino (A. Agassiz).

18. ARABELLA MUNDA, sp. nov.

The general color light reddish brown with a darker longitudinal stripe, which is not sharply limited, along each side of the dorsum just above the parapodia. Body moderately narrowed from the middle cephalad but much more strongly so caudad, the posterior end being pointed.

This species in some features much suggests *A. attenuata* Treadwell but appears obviously distinct in the structure of the maxillae. These are black throughout. Right maxilla I with seven (six) large teeth, the fang at distal end bent mesad almost at right angle. Maxillae II strongly asymmetrical as in *A. mimetica* Chamberlin. The right plate long and extending proximad down the mesal side of the dental line of I to base of latter; bearing nine or ten teeth and at anterior end a large curved fang well separated from teeth by a smooth edge. Right maxilla II much shorter, ending posteriorly at anterior end of dental series of I; toothed all the way to anterior fang, there being seven rather blunt teeth excepting the one adjacent to the fang which is much smaller and more acute than the others. The left maxilla II bears six teeth inclusive of the terminal fang, the tooth at the base of which is much smaller than the others, the third tooth from the proximal end largest. Right maxilla III with four teeth, the fang more widely separated because of the obliteration, or nearly so, of the minor tooth adjacent to it in the left plate. Right maxilla IV with four small even teeth. Plate V reduced to a small hook as usual.

Prostomium broadly ovate, more rounded anteriorly than represented for *A. attenuata*; clearly longer than the first two somites together. Eyes in a transverse row across base as usual; the median ones more sharply defined than the lateral ones but much smaller, the reverse of the relation in *attenuata*.

First achaetous segment much longer than the second.

Posterior lobe of parapodia large, projecting caudoectad and also curving more or less dorsad, distally bluntly rounded, always much exceeded by the setae. Setae in middle region of body mostly from five to eight in number in each parapodium. Upper ones with long shafts, strongly bent at beginning of limbate portion, the distal curve gentle. Number of segments in type three hundred and fourteen.

Length, 95 mm.; greatest width, 2.2 mm.
Locality.— Calif.: Crescent City (A. Agassiz).
Type.— M. C. Z. 211.

19. BIBORIN ECBOLA Chamberlin.

Pomona College journ. zool. ent., 1919, **11**, p. 13.

One specimen taken between tide marks on San Miguel Island by W. G. W. Harford. It is a larger specimen than the type, being 135 mm. long and having a maximum diameter of 2.5 mm. though composed of fewer somites,— about two hundred and forty-five as against two hundred and seventy-seven. It is brown in color with superficial iridescence. The prostomium is less pointed than in the type, anteriorly more broadly rounded, though this seems in part due to shrinkage from preservation. The posterior process of parapodium is longer in general proportionately to the basal part of parapodium and to the setae.

GLYCERIDAE.

20. GLYCERA ROBUSTA Ehlers.

Borstenwürmer, 1868, p. 656, pl. 24, fig. 31, 32.

Ehlers based this species upon four specimens forming part of this collection and coming from San Francisco and Mendocino. These types cannot now be found in the collections of the M. C. Z. to which Ehlers states they belong. In the Museum, however, are some finely preserved topotypes from Mendocino (A. Agassiz). Other specimens of the species are simply labeled "California, Capt. Brown." I have found this species not uncommon on Monterey Bay.

ARICIIDAE.

21. NAINEREIS LONGA Moore.

Proc. Acad. nat. sci. Philad., 1909, p. 264.

Several specimens taken at Crescent City (A. Agassiz).

22. NAINEREIS NANNOBRANCHIA, sp. nov.

Plate 2, fig. 10; Plate 3, fig. 1.

This form differs from the others known from the coast of California in having the branchiae begin much farther caudad, the first ones appearing on XX to XXIII, and in the marked reduction of the branchiae in the posterior region. The first ones are small and tubercle-like. The others soon increase caudad to stout conical forms, which curve mesad but with those of opposite sides always well separated by a wide mid-dorsal space, and then, in posterior region, again becoming more slender and much shorter. In structure and arrangement of setae most resembling *N. hespera* Chamberlin; but, aside from the very different branchiae, readily distinguishable from that species in the different form of the prostomium, this lacking the anterior median emargination, being simply rounded and as a whole semicircular in outline with anterior end, however, a little narrowed. Postsetal lobe of anterior notopodia larger, subconical, becoming smaller caudad. Postsetal lobe of thoracic neuropodia vertically elongate, but low with edge broadly convex, decreasing in height caudad; replaced in abdominal region by a small conical process. Thoracic neuropodials in three subvertical series in addition to a ventrocaudal fascicle of longer, capillary cross-striate setae. The coarser setae of the posterior series are continuously narrowed distad with apex narrowly rounded; each abruptly, strongly bent, nearly geniculate, with terminal region long; without serration or cross-ridging on the convex side, but some weak cross wrinkles indicated on the angle on the concave side. Setae of the other two series proximally stout, narrowing abruptly into the usual long, slender, distal region, this with a double curve, strongly finely cross-ridged on the concave side of proximal curve and some distance proximad of this on stouter part of seta. Twenty-six segments in anterior region. Total number of segments in type near two hundred and thirty-seven.

Length of type about 50 mm.; greatest width, 3 mm.
Locality.— Calif.: Mendocino (A. Agassiz).
Type.— M. C. Z. 2,136. *Paratype.*—M. C. Z. 111.

SABELLARIIDAE.

23. SABELLARIA CALIFORNICA Fewkes.

Bull. Essex inst., 1889, **21**, p. 130, pl. 7, fig. 3, 4.

Mendocino (A. Agassiz).

24. SABELLARIA NANELLA, sp. nov.

Plate **2**, fig. 5–7.

This is a very small species readily distinguishable by the forms of the opercular paleoli. The paleoli of the outer series have long, slender, closely contiguous stems, normally mostly concealed, the free part expanding into broad, colorless, or weakly golden shining blades which narrow a little distad; the distal end finely pectinate with a process or spine toward ventral end of series much longer and stouter than the other. On each side they number twenty-nine or thirty and form a close semicircle spreading out horizontally, *i. e.*, at right angles to long axis of body. The paleoli of the inner series are also arranged in a semicircle with convexity ectad. They are plate-like and contiguous at base but narrow strongly and acutely distad, the tips slightly bent ventrad so that the end appears narrowly truncate. Each blade continues just above base on ectal side into a rounded, short, and broad, process or spur. They number about twenty on each side. The paleoli of the middle series are expanded above their bases into short broad plates shaped somewhat like the head of an adze with edge of blade ectad and narrowed end mesad, the plates lying contiguously as a pavement or with edges more commonly overlapping, between bases of the other two series of paleoli. They number about twenty-two in each series. The opercular lobes together as a whole are long, strongly expanded distally, in a trumpet-form greatly exceeding the rest of the body in diameter. The parathoracic notopodial paleoli are elongate, thin blades with sides nearly parallel to near tip where they expand a little clavately and then narrow abruptly to an acute apex. The body as a whole is very slender, in all cases with a segment at anterior end of abdomen characteristically globularly thickened.

The greatest thickness of thorax about 1.8 mm., while the width across end of the opercular lobes is up to 1.6 mm.

Locality.— Calif.: San Francisco (A. Agassiz). Numerous specimens.

Type.— M. C. Z. 2,132. *Paratypes.*— M .C. Z. 482.

25. IDANTHYRSUS ORNAMENTATUS, sp. nov.

Plate 3, fig. 2–5.

General color brown. On each side of operculum at about middle of length a large, dark, almost black, spot with a line-like dorsal prolongation to the dorsal furrow. Also a narrow deep colored stripe below the outer series of paleoli on each side. Achaetous caudal region dark anteriorly. Outer paleoli yellow, the inner ones darker, bronze colored. Outer paleoli pinnately branched and the inner ones slender and wholly smooth. Outer paleoli in a series extending around anterior end of inner series, thirty-six in number. Inner paleoli eleven or twelve in each series. Area outlined by the two series on each side very narrow. Papillae below outer paleoli short, conical, well separated, fifteen on each side of which the anterior three are longer than the others. Two pairs of nuchal hooks present in the type. Second setigerous somite with three cirri above setigerous papilla on each side; of these the most dorsal is largest and corresponds in form, size, and position to the branchiae of the succeeding somites; the two below this much shorter, stout, and rounded. The dorsal thoracic paleoli nine or ten in number; not at all clavately widened distad, the plates rather narrow with sides parallel to acutely attenuated distal region, this acuminate region rather long with the narrowing gradual and even, the species in the form of the paleoli being readily distinguishable from *I. johnstoni* (McIntosh) and *I. armata* (Kinberg) which it resembles in the form of the opercular paleoli. Ventral thoracic setae very slender. Uncini elongate and slender, much as in *I. regina* Chamberlin but with the margin opposite the teeth more strongly and evenly curved and the body moderately widened and strongly rounded at end; bearing eight long, slender teeth. Setigerous somites sixty. The achaetous appendage very short.

Length near 50 mm. Width across thorax, near 5.5 mm.; width across opercular lobes to outer ends of paleoli, 8.8 mm.; to bases of paleoli 5.5 mm.

Locality.— Calif.: Mendocino (A. Agassiz).

Type.— M. C. Z. 156.

CIRRATULIDAE.

26. AUDOUINIA SPIRABRANCHUS (Moore).

Cirratulus spirabranchus Moore, Proc. Acad. nat. sci. Philad., 1904, p. 492, pl. 38, fig. 26–29.

Numerous specimens referable to this species were taken by Mr. Agassiz at Mendocino and Crescent City.

27. CIRRATULUS EXUBERANS, sp. nov.

This species is well characterized by its prostomium. This is short and wide; the anterior margin wide, as a whole but moderately convex, indented on each side of the middle so as to present three large, low lobes or crenations. Anterior, more depressed, region crossed by a single series of eyes, the series continuous, not interrupted in mid-dorsal region, and consisting of twenty-two eyes of which the five in the mid-dorsal region are smaller than those on each side of them. The peristomium dorsally divided into seven or eight short subdivisions by transverse sulci. The special dorsal branchiae in two dense bands on the first setigerous somite, the two bands narrowly separated in the mid-dorsal region, the branchiae in these groups numerous and, like the others very long and forming a dense tangled mass. Other branchiae present nearly to the caudal end, about the sixteen to twenty last segments, however, appearing to lack them. They are situated unusually high on the dorsum in the posterior region, the space between them and the notopodia on each side much exceeding the distance between notopodia and neuropodia, but in the anterior region they come to arise close above the notopodia. Notopodia and neuropodia a nearly uniform distance apart throughout length, more ventrad than usual. Neuropodial crochets begin on or near segment XXV. Total number of segments in type one hundred and fifty-five.

Length 58 mm.; width 5 mm.
Locality.— Panama.
Type.— M. C. Z. 1,285.

Terebellidae.

28. Pista brevibranchia, sp. nov.

Plate **2**, fig. 1–4.

This species much resembles *P. fratrella* Chamberlin, known from Laguna Beach, Cal., which it approaches in form of the uncini of the several regions more closely than it does *P. alata* Moore. It differs from both these species in having much smaller branchiae with fewer branches and much shorter trunks. There are two pairs, arising on II and III respectively. Of these the posterior much exceed the anterior in size, with the right posterior largest. The anterior branchiae with terminal branches very short, the entire organ in length scarcely equalling that of the trunk of the right posterior. Branchiae of each pair attached close together, trunks nearly contiguous at middle line. Tentacles in a transverse series, attached by contracted bases; short and rather thick but distally moderately tapered. On tentaculiferous ridge above and on anterior surface of peristomial collar-lobes above numerous short papillae. Peristomium with anterior edge produced into a prominent flaring collar with ends widely separated above; deeply emarginate ventrally, leaving the lateral portions as prominent wings. Second somite with anterior edge produced across ventral surface and part way up each side, the wing laterally overlapped on each side by the larger one of III. The latter is scarcely evident, obsolete, across venter, but forms a very prominent wing on each side which rises to a level in front of the setigerous tubercle of IV and thus considerably farther dorsad and mesad than the peristomial collar; the wings are not united across the dorsum, the dorsal surface of III simply depressed below the level of IV. Along the anterior edge of IV on each side also a well-developed wing which, however, is much lower than that of III and does not extend so far dorsad. On V and VI are similar but smaller wings which do not extend half way to the setigerous papillae, and a smaller one on each side of VII. The thoracic setae are distally moderately curved with the limbus on the convex side broad, the other one narrow. As in *fratrella* the uncini show progressively reduced manubria in the anterior double rows as well as in the single rows farther forward. In these there is a distinct rounded shoulder besides at the base of the manubrium on the side toward the neck of the plate.

In the posterior thoracic uncini the base shows a distinct angulation or shoulder at or toward the base of the neck in place of the triangular median process shown in *alata*. This shoulder is also present in the smaller abdominal uncini; it is more abrupt and prominent, less gentle and rounded than in *fratrella* while it is quite absent in *alata*. The beak in the manubriate uncini is more divergent than in *fratrella*.

Greatest width, 3 mm. The specimen incomplete posteriorly. Forty-nine segments in the two pieces present.

Locality.— Calif.: Mendocino (A. Agassiz).

Type.— M. C. Z. 502.

29. Eupolymnia regnans Chamberlin.

Mem. M. C. Z., 1918, **48**, p. 433, pl. 79, fig. 1–3.

One large and several partly grown specimens of this species were collected by Mr. Agassiz at Panama, the type-locality, where the species is apparently common.

30. Eupolymnia crescentis, sp. nov.

Plate **3**, fig. 6, 7.

This species differs from the widespread Indo-Pacific *E. trigonostoma* Schmarda (syn. *P. congruens* Marenzeller) and other previously described species in the form of the uncini. The uncini as compared with those of *trigonostoma* are much more slender, evenly curved, with the beak proportionately longer, reaching nearer to the end of the plate; the subrostral process nearer the end away from the base of the beak, farther removed from tip of beak; the basal projection or shoulder small, much slighter than in *trigonostoma*. Just caudad of the tentaculiferous fold are numerous minute dark eye-spots. Tentacles crowded, numerous and long; slender; each with the usual longitudinal groove. Segmental papillae present only on segments III, IV, and V. Of the thoracic uncinigerous tori the first six bear the uncini in single simple series, the others in a double, interlocking series. Seventeen setigerous somites present. Ventral thoracic plates very wide, trapeziform, the lateral ends being angularly pointed; the anterior ones rather more than twice as wide as the length of the adjacent row of uncini; caudad the anterior margin becomes more decidedly convex; on II, III, and IV they are not set off from the lateral region; these plates roughened; caudad of XVI, plates reduced and longitudinally divided. First branchiae decidedly longer than the others, the trunks stouter and longer, with two main limbs and a dense brush of terminal branches. Total number of segments in type near eighty-five.

Length, 110 mm.; width of thorax, 11 mm.
Locality.— Calif.: Crescent City (A. Agassiz).
Type.— M. C. Z. 2,135. *Paratypes.*— M. C. Z. 449.

31. SCIONIDES DUX, sp. nov.

Plate **3**, fig. 9.

As compared with the genotype (*Terebella reticulata* Ehlers) this is a very much larger species easily differentiated as well by various other characters, such as the structure of uncini which, while agreeing closely in more general features, differ in numerous details. These have the basal shoulder more remote from the crest, thus leaving the neck-region longer; the sinus wider at bottom, the beak less divergent from principal axis. Differing from those of *reticulata* decidedly in having the denticles of the crest in five series instead of in four with the teeth of these series more numerous, the larger teeth of the lowermost row, *e. g.*, numbering six instead of only two. There are seventeen setigerous segments, bearing setae of simple limbate type, with no trace of distal denticulations. The uncini begin on the second of these (V); they are in single series on the first six pairs of tori and in a double interlocking series on the remaining pairs. There is a non-setigerous tubercle below each of the second branchiae (somite III), this well developed but much more slender than the setigerous one. Tentacular filaments numerous, closely crowded in a series across anterior edge of fold, flat and ribbon formed, long. No eye-spots observable in types. Peristomium with labial edge below wide and straight, a second edge farther caudad with elongate pit or depression between the two. Branchiae three pairs on II, III, and IV. These ramose, with thick trunks and principal limbs, and numerous fine terminal branches or filaments densely grouped. The third branchiae are inserted obviously nearer together than the second and first. Not differing in length but the second branchiae with more abundant branches. First twelve ventral plates broad, the first ones oblong, the others becoming trapeziform, the subsequent ones very narrow. Plate of segment II longer than that of III and both much longer than those of IV and V, the others increasing in length and decreasing in width in going caudad. Number of segments in type seventy-five.

Length, 125 mm.; width across thorax, 10 mm.
Locality.— Calif.: Crescent City (A. Agassiz).
Type.— M. C. Z. 2,034. *Paratypes.*— M. C. Z. 228.

Six specimens from Mendocino (M. C. Z. 75) are also referred to this species. They agree closely in most features though the branchiae are shorter and the uncini are apparently slightly more slender.

32. THELEPUS CRISPUS Johnson.

Proc. Boston soc. nat. hist., 1901, **29**, p. 428, pl. 17, fig. 175–178b.

Several small specimens of this species were collected by Mr. Agassiz at Crescent City, others at San Francisco, and many at Mendocino.

SABELLIDAE.

33. EUDISTYLIA POLYMORPHA (Johnson).

Bispira polymorpha Johnson, Proc. Boston soc. nat. hist., 1901, **29**, p. 429, pl. 17, fig. 179–183; pl. 18, fig. 184, 185.

Five specimens of this form were taken by Mr. Agassiz in the Gulf of Georgia, Washington, and preserved free from their tubes. Three of these are exceptionally large, one having a width across thorax of nearly 20 mm. In addition to these specimens (M. C. Z. 485) there are several specimens *in situ* in their tough cartilaginous tubes (M. C. Z. 486).

34. DISTYLIA MONTEREA, sp. nov.

In comparing Mr. Agassiz's Gulf of Georgia specimens of *E. polymorpha* with Johnson's types of that species it was noted that a specimen from Pacific Grove labeled by Johnson as one of the paratypes was not conspecific or even congeneric with the others. In size, form, coloration, and general appearance it is remarkably similar to *polymorpha*, but that it is really generically distinct is at once shown by the fact that the inferior setae of the collar-fascicle are lanceolate instead of spatulate in form. These setae are also much fewer in number than in *polymorpha*. The inferior thoracic setae of the other segments, however, are of the usual spatulate form. Another readily noted difference, which at the same time separates this species from *Distylia rugosa* (Moore), is that there are only seven setigerous thoracic somites instead of eight. Whereas in *rugosa* the eyes are very numerous, approximating one hundred on each radiole, in the present species they are very sparse, most radioles lacking them entirely; when present they are usually two on a radiole and widely separated, occasionally three. The collar is prominent with the general dorsal opening wider than in *rugosa*, equalling fully three fourths the body width at that level. The dorsal lobes very low in proportion to width. The ventral lobes in the type are widely separated by a V-shaped opening, not contiguous or overlapping as in *polymorpha*. The general coloration is that of *polymorpha*, the branchiae having a similar deep wine-color with lighter transverse bandings distally. Number of segments in type, near two hundred and twelve.

Length without branchiae, 140 mm.; greatest width, 12 mm.
Locality.— Calif.: Pacific Grove (H. P. Johnson).
Type.— M. C. Z. 1,941.

35. PSEUDOPOTAMILLA PAUROPS Chamberlin.

Pomona college journ. zool. ent., 1919, **11**, p. 21.

A single specimen, now unfortunately dry, taken at Mendocino, (A. Agassiz) agrees with this species so far as the characters are evident. Previously known from Laguna Beach, Calif.

36. PSEUDOPOTAMILLA BREVIBRANCHIATA Moore.

Proc. Acad. nat. sci. Philad., 1905, p. 555, pl. 37, fig. 1–7.

Several dry specimens seem to conform to this species, though the branchiae are rather longer than indicated in the original description. The branchiae agree in structure and number and have the eyes similar in prominence, number, and distribution over the middle half of the radioles. The uncini agree very well, though in those of the sixth segment the neck appears to be a little more slender; the beak and crest together have the characteristic straight anterior edge with the tip of beak slightly bent forward. The specimens were taken at Mendocino (A. Agassiz).

37. PSEUDOPOTAMILLA PANAMICA, sp. nov.

Plate **3**, fig. 8.

In the type of this form there is a total of sixty-seven somites of which nine (eight setigerous) are thoracic. The branchiae are transversely banded with dark, the banding dusky and not sharply limited. The branchial membrane crossed longitudinally by purplish lines, one being opposite the interval between each two radioles. On the thorax a broad purplish brown longitudinal band mesad of and more or less embracing the notopodia on each side, a yellow median dorsal stripe between the two dark bands, the latter fading out caudad. Ventral plates pale orange, the anterior thoracic ones darkened at each lateral end, a dark band extending up each side of the first segment and a dark line in front and one behind each of the anterior tori. Ventral lobes of collar not extending much forward, broadly overlapping in the middle line. The dorsolateral incision on each side deep and narrow; each dorsal lobe extending forward beyond the lateral part, oblong, with ectoanterior corner and anterior end convexly rounded, the anteromesal corner subrectangular, the mesal edge a little concave, the ectal gently convex. Free dorsal margins of branchial basal membrane not at all incised or lobed, well separated. No eyes present. Radioles twenty-two on each side, in a simple series. All thoracic plates and the first abdominal one entire, the other abdominal plates longitudinally bisected. Thoracic uncini characterized by an unusually long and erect neck, the lower protruding lobe small, the beak straight and widely diverging. Inferior thoracic setae distally spatulate with a slender acute tip usually curving more or less at an angle with the blade.

Length, 35 mm.; greatest width, 3.5 mm.

Locality.— Panama.

Type.— M. C. Z. 72.

The tube proper is tough and parchment-like with outer surface densely coated with shell fragments and sand.

SERPULIDAE.

38. SERPULA VERMICULARIS Linné.

Syst. nat., ed. 12, 1767, **1**, p. 1267.

Serpula vasifera Haswell, Proc. Linn. soc. N. S. W., 1885, **9**, p. 608, pl. 31, fig. 1, pl. 32, fig. 6–8.

Serpula columbiana Johnson, Proc. Boston soc. nat. hist., 1901, **29**, p. 432, pl. 19, fig. 199–204.

Serpula narconensis Collin, Semon's forsch. Austr. Malayen archipel., 1902, p. 100.

Serpula granulosa Willey, Ceylon pearl oyster fisheries report. Suppl., 1905, p. 316, pl. 7, fig. 186, 186a.

Several specimens of this widespread form, of which the synonomy pertaining to the Pacific region only is given, with their bright white tubes were taken by Mr. Agassiz at Mendocino, and in the Gulf of Georgia, Wash.

39. SERPULA NANNOIDES, sp. nov.

Plate **2**, fig. 8.

The present form, as represented by the several type-specimens, is greatly exceeded in size by *S. vermicularis* and *S. splendens*. From both these species readily distinguishable in having the collar-fascia relatively much longer and more prominent, greatly exceeding the following fasciae instead of being smaller than them. Collar-setae stouter and darker than the others and differing in structure as usual; bayonet forms with spurs stouter than in *vermicularis*, rounded. Thoracic membrane at lower end below on each side with two caudally directed, triangular lobes or flaps of which the lower is usually much larger, the upper one sometimes scarcely obvious; on ventral side the collar-membrane protrudes forward at middle where it is simply rounded, not at all incised. Operculum funnel-shaped, thin and less rigid than in *vermicularis*, more or less readily collapsible. Number of crenations along edge of operculum about ninety. Secondary operculum not observed in the types.

Greatest width, near 2.5 mm.
Locality.— Calif.: Crescent City (A. Agassiz).
Type.— M. C. Z. 511. *Paratypes.*— M. C. Z. 2,131.

40. CRUCIGERA HESPERA, sp. nov.

Plate **2**, fig. 9.

The type of this species is notably smaller than that of *C. zygophera* (Johnson) with which it has been compared. It is obviously different in the form of the operculum. The operculum proper is similarly regular but is decidedly narrower, not truly campanulate, the radii not flaring out distally but with their acute apices in a distal median position on each. Radii twenty-five in number. As in *zygophera* there is on one side but a single rounded, ectally flattened or concavely depressed lobe beneath which the distally abruptly constricted stalk is attached. On the other side are two more prominent lobes; these are more widely divergent than in *zygophera* and instead of being straight are distally geniculate, the short apex extending up at right angles to the axis of the basal part and well rounded. Secondary operculum more slender, distally less bluntly rounded than in *zygophera*.

Width across thorax, 2.5 mm. Width across operculum, 1.8 mm.
Locality.— Calif.: Mendocino (A. Agassiz).
Type.— M. C. Z. 164.

EXPLANATION OF THE PLATES.

PLATE 1.

PLATE 1.

Hesperonoe senilis Chamberlin.

Fig. 1. Notopodial seta of first type. × 152.
Fig. 2. Notopodial seta of second type. × 152.
Fig. 3. Neuropodial seta of first type. × 152.
Fig. 4. Neuropodial seta of second type. × 152.

Nereis mendocinana Chamberlin.

Fig. 5. Dorsal view of prostomium. × 47.

Leodice valens Chamberlin.

Fig. 6. Composite seta. × 300.
Fig. 7. Mandibles. × 14.
Fig. 8. Maxillae I. × 14.

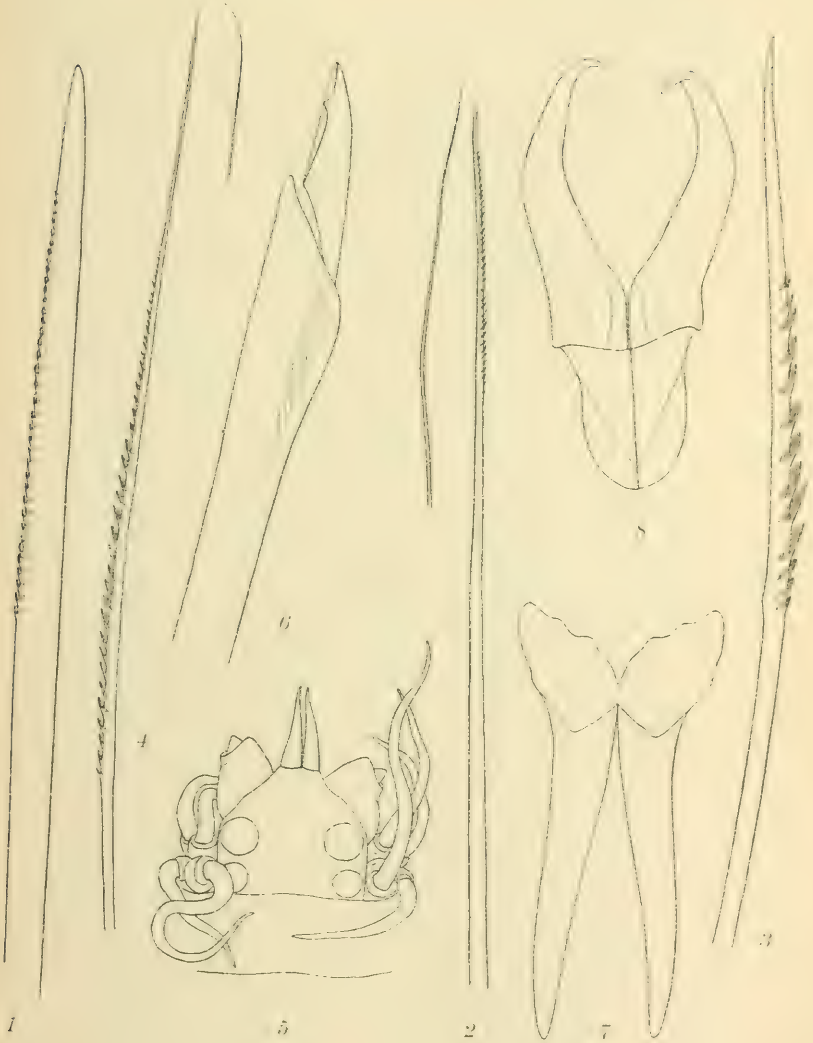


PLATE 2.

PLATE 2.

Pista brevibranchia Chamberlin.

Fig. 1. Thoracic uncinus of segment V. × 616.
Fig. 2. Thoracic uncinus of segment XI. × 616.
Fig. 3. Thoracic uncinus of segment XX. × 616.
Fig. 4. Abdominal uncinus.

Sabellaria nanella Chamberlin.

Fig. 5. Opercular paleolus of outer series, caudoectal view. × 80.
Fig. 6. Opercular paleolus of inner series, lateral view. × 80.
Fig. 7. Parathoracic notopodial seta. × 244.

Serpula nannoides Chamberlin.

Fig. 8. Operculum. × 20.

Crucigera hespera Chamberlin.

Fig. 9. Operculum. × 20.

Nainereis nannobranchia Chamberlin.

Fig. 10. Thoracic neuropodial seta of posterior series. × 180.

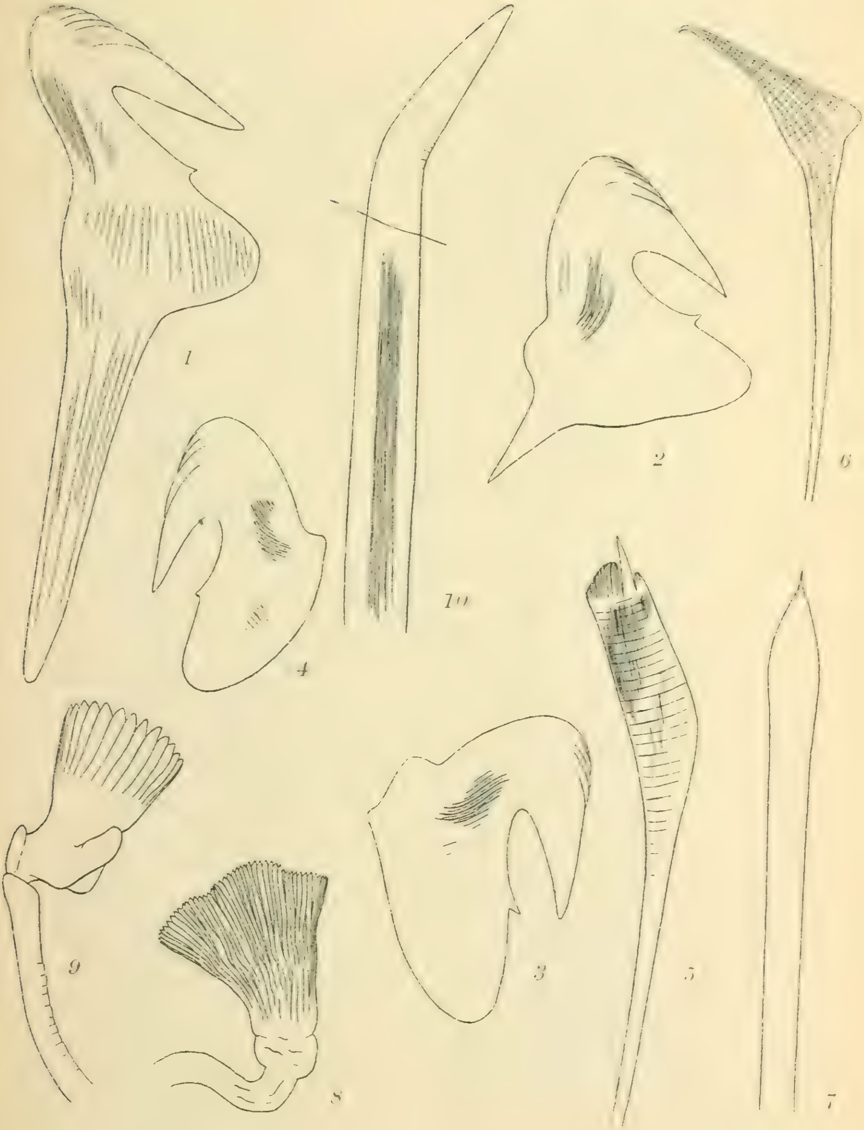


PLATE 3.

PLATE 3.

Naineréis nannobranchia Chamberlin.

Fig. 1. Thoracic neuropodial seta of anterior series. × 180.

Idanthrysus ornamentatus Chamberlin.

Fig. 2. Opercular paleolus of inner series. × 38.
Fig. 3. Opercular paleolus of outer series. × 38.
Fig. 4. Thoracic paleolus. × 38.
Fig. 5. Abdominal uncinus. × 616.

Eupolymnia crescentis Chamberlin.

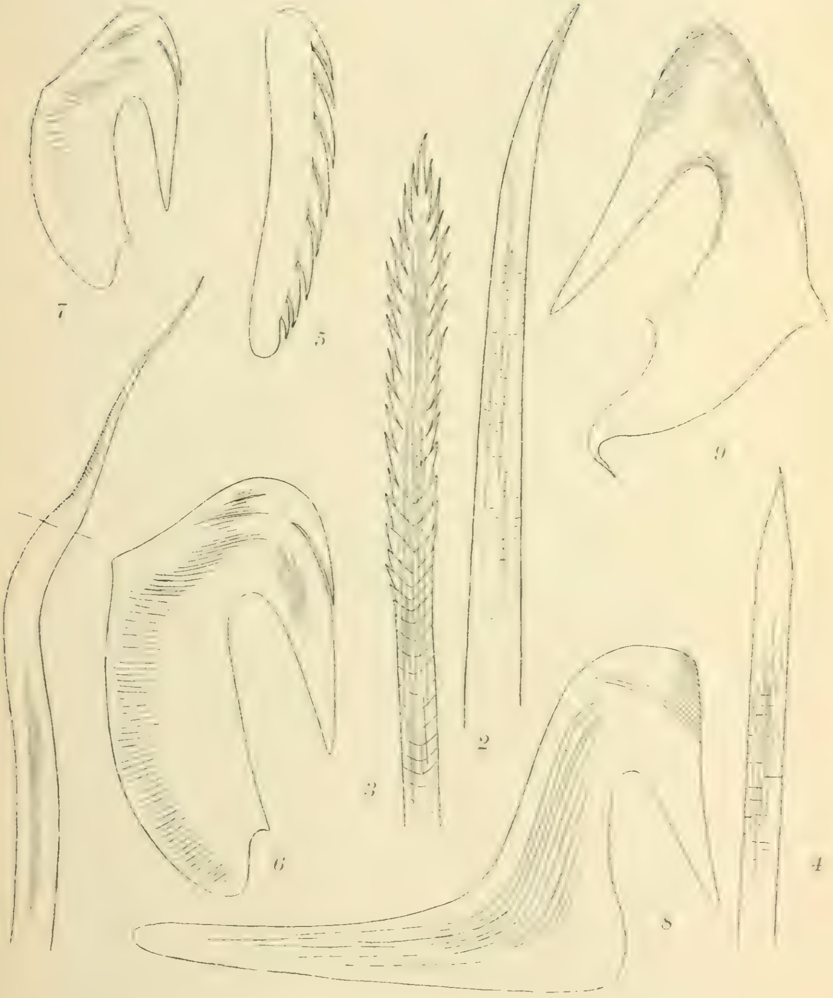
Fig. 6. Thoracic uncinus. × 616.
Fig. 7. Abdominal uncinus. × 616.

Pseudopotamilla panamica Chamberlin.

Fig. 8. Thoracic uncinus. × 616.

Scionides dux Chamberlin.

Fig. 9. Thoracic uncinus. × 616.



Bulletin of the Museum of Comparative Zoölogy
AT HARVARD COLLEGE.
Vol. LXIII. No. 7.

THE ANTS OF THE BRITISH SOLOMON ISLANDS.

By William M. Mann.

With Two Plates.

CAMBRIDGE, MASS., U. S. A.:
PRINTED FOR THE MUSEUM.
December, 1919.

No. 7.— *The Ants of the British Solomon Islands.*

By William M. Mann.

Introduction and Itinerary.

During the years 1915–1916 the writer was the holder of a Sheldon Travelling Fellowship of Harvard University and funds from this were used in zoölogical exploration of certain South Sea Islands. Later the Museum of Comparative Zoölogy contributed a sum of money, which, with funds from other sources, enabled me to continue the work and to visit the British Solomon Islands, where I remained from 19 May to 24 November, 1916.

Upon my arrival and throughout my entire stay I was the recipient of so many courtesies and so much aid from so many people that to enumerate them would be practically to make a census of the white population of the islands.

Some time was spent on Florida, where Dr. O'Sullivan, the port doctor, welcomed me to his home at Tulagi and stored my specimens and supplies while I was in the out-islands.

Malaita was next visited. Mr. W. R. Bell, with whom I stayed at Auki, the government station of which he is in charge, made many excursions with me into the little known interior and some months afterward, on my return to Auki, we crossed the island, camping one night in the mountains, where, at an altitude of about 2,300 feet, we encountered a number of species not found elsewhere, among them *Crematogaster* (*Rhachiocrema*, subg. nov.) *wheeleri*, sp. nov. and the curious *Polyrhachis* (*Dolichorhachis*, subg. nov.) *malaënsis*, sp. nov. The native constabulary who accompanied us, necessary companions in the forests of Malaita, proved to be excellent collectors and to them both on Malaita and San Cristoval, I am indebted for many valuable specimens.

Mr. Symmington, Manager for the Lever's Pacific Plantations Company, permitted me to travel on the Kobiloko, a small steamer that plies between certain of the islands, and this made possible a five days stop at the remote Santa Cruz Group. Here Mr. Jack Mathews arranged with the natives so that I was able to collect not only unmolested by, but with considerable help from them. On the return of the Kobiloko I landed at Ugi, the type-locality for many of the Solomon Island species, and remained there for several weeks at Pawa as guests of Messrs.

Hall and Dickerson; also visiting the nearby island of Malapaina, one of the Three Sisters Group, and staying there with Mr. Ireland, a young Australian engaged in clearing the forests for a new plantation. At Pamua, on the mainland of San Cristoval, I lived with the Rev. Mr. Nind, at the school maintained there by the Melanesian Mission. Their steamer, the SOUTHERN CROSS called and through the courtesy of the Rev. Mr. Wood, Bishop of Melanesia, I received a passage to Wainoni Bay. Here the two French priest-missionaries, Fathers Moreau and Babbiau, cared for me. For their great kindness, especially when stricken with fever, I am deeply grateful.

Mr. Harry Jacobsen, a planter and trader, took me from Wainoni Bay to Star Harbor, his station at the extreme eastern end of the island, and made numerous trips with me along the coast and to the neighboring island of Santa Anna, and afterwards up the coast to Keri Keri, where I met Captain F. M. Campbell, Director of native constabulary, and returned to Tulagi with him. Then Mr. Abbott, Government Labor Agent, invited me to accompany him on his launch to the Russell Islands. In New Georgia I lived with Mr. Norman Wheatley, Nestor of South Sea traders, travelled about the beautiful, though gruesomely historic, Rubiana Lagoon with him and also stopped at Rendova for a few days with Mr. Palmer.

Toward the end of my stay, I collected for three weeks at Fulakora on the western end of Ysabel, living at the plantation of Mr. Charles Bignell, a gentleman who spent much time collecting with me and after my departure sent me a considerable number of interesting species.

To all of these gentlemen and to others, I am greatly indebted for making my stay in the Solomons not only safe and successful, but immensely enjoyable. Without their aid I could have done comparatively little collecting.

The greater part of the country is heavily wooded and, as might be expected, a large proportion of the species are arboreal. The character of the fauna changes markedly when the forest is cleared and in the plantations one is impressed by the scarcity of endemic forms, which have been supplanted by introduced species. Every log or board on the ground shelters formicaries of tropicopolitan ants, chiefly *Plagiolepis longipes* and *Prenolepis longicornis*. A few Oriental species, as *Oecophylla smaragdina* and *Technomyrmex albipes*, are apparently able to hold their own and *Camponotus reticulatus bedoti* is not uncommon in cleared land, but most of the native species are doomed as soon as the forest goes. The above tramp species do not usually wander far into the forest, though *Plagiolepis longipes* is sometimes seen there under conditions noted hereafter.

It is interesting that *Solenopsis geminata rufa* has not yet established itself in the Solomons. Neither does it occur in Fiji, though it is common in both New Guinea and in Tahiti.

One faunal peculiarity is the prevalence of white-tipped antennae among the ants, species of three genera Wheeleripone, *Crematogaster* (*Rhachiocrema*) *wheeleri* and *Polyrhachis* (*P. ulysses*, *P. osae*) having this unusual, among ants, coloration.

The ant fauna of the Solomons has been comparatively untouched. Mr. W. W. Froggatt, who visited the islands for the purpose of studying the insects of the coco-nut palm, collected a few species at Tulagi, on Guadalcanar, and in the Russell Group. These, recorded by Forel in a paper on Australian ants (Rev. Suisse zool., 1910, **18**, 1–94), are the only species listed from the Solomons. In the present paper are noted 144 forms, representing forty-three genera.

Ants abound in the forests. Along the paths one sees species of Polyrhachis of the *relucens* or *daemeli* groups on nearly every tree and shrub. In the eastern islands the leaves of single trees sometimes hold a half dozen nests of such forms as *Polyrhachis osae* and *P. mucronata malaensis*. A rotten log will almost certainly contain colonies of *Vollenhovia pedestris*, *Phopalothrix malua*, *Myopopone castanea*, or *Rhytidoponera froggatti*. On the beaches if one leans against a tree he will probably be covered by swarms of *Iridomyrmex myrmecodiae* which run about and attempt to bite in an annoying manner very similar to species of Azteca in the American tropics; among trees that have recently been felled, *Oecophylla smaragdina nitida* makes collecting a misery by its numbers and aggressiveness.

The last few days of collecting yielded a number of genera and species not taken previously and I am convinced that the present list contains only a small part of the species that occur in this island group. The interior especially will be productive of many additional forms of great interest, for with the exception of the few that I list from the interior of Malaita, the ant fauna of the highlands is absolutely unknown.

As far as the zoögeographical position of the Solomons is concerned, the distribution of the ants merely corroborates the opinion of Wallace who, (The Malay Archipelago, 1869, **2**, p. 435) on the basis of the presence of crimson lories and of cockatoos allied to those of New Guinea, assumes that the fauna is a continuation of the Papuan.

Of the forty-three genera recorded in the present paper, none are peculiar (Wheeleripone occurs also in Fiji). Typical Australian genera are represented only by Rhytidoponera, Podomyrma, Turneria, and Opisthopsis, each with a single species.

The remaining genera are all widely distributed in Indo-Malaya. Of these the following terminate their eastward distribution in the Solomons: — Myopopone, Platythyrea, Cryptopone, Ectomomyrmex, Crematogaster, Myrmecina, and Acropyga.

Other genera, as Euponera, Anochetus, Vollenhovia, Tetramorium, Pristomyrmex, Triglyphothrix, Oligomyrmex, and Polyrhachis are well developed in the Papuan region, but extend eastward of the Solomons in only a few species, which are usually widely distributed.

Two species of wide distribution, *Leptogenys diminuta* and *Oecophylla smaragdina*, terminate their natural distribution in the Solomons, for though the latter species occurs in Samoa, it is of recent introduction.

In general the Solomon Island ant fauna is Papuan, without peculiar forms, and lacking a number of typical Papuan genera. The Santa Cruz ant fauna is similar to that of the Solomons proper and may be considered as the eastern limit of the Papuan subregion.

The nearby island of Vanikoro has not been explored entomologically but forests of Araucarians are known to occur there. This is then the most northwestern locality for the Araucarinae and the island containing it probably belongs to the Melanesian subregion, so a line between the two islands separates the two subregions.[1]

In the preparation of this paper, I have been greatly assisted by Prof. W. M. Wheeler of Harvard University, who has generously permitted me to use his collection for comparison and has aided me in certain determinations and in other ways. Prof. Carlo Emery, of Bologna has kindly compared a number of species with types in his collection.

Most of the figures of new species were made by Dr. R. McEwen.

---

[1] The Melanesian subregion, (including Vanikoro, the New Hebrides, New Caledonia and Fiji), like the Chilean and the Malagasy, might be described as a biological conservatory, where types once tropicopolitan have been isolated and preserved, free from invasion. It is distinct from Papuasia though the presence of numbers of these relicts, and in negative characters, lacking the majority of the plant and animal groups characteristic of the latter subregion. The absence of any group which had its origin in this region is an important negative character.

FORMICIDAE: PONERINAE.

1a. CERAPACHYS (SYSCIA) PUSILLA Emery, subsp. PAWA, subsp. nov.

A single worker found beneath a stone agrees with Emery's description of *papuana* from New Guinea, except that it is smaller and less opaque and has the postpetiole distinctly longer than broad for which reason I refer it to the closely related *pusilla* Emery, also from New Guinea, which differs from *papuana* in the same characters.

The subspecies *pawa* differs from *pusilla* only in sculpture. The head is irregularly and coarsely punctate and rugose. The thorax is shining and more regularly punctate and not rugose.

The legs are shining.

Ugi: Pawa.

2. CERAPACHYS (CERAPACHYS) TERRICOLA, sp. nov.

Worker. Length 3.5 mm.

Head a third longer than broad, as broad in front as behind, with moderately rounded sides, nearly rectangular occipital corners and feebly concave occipital border. Mandibles short and stout, blades minutely denticulate. Frontal lobes short, narrowly separated. Anterior border of clypeus almost straight. Antennal scopes thick, club-shaped, extending more than half the distance to occipital corners; first flagellar joint as long as broad; joints 2–11 transverse; apical joint as long as the six preceding joints and at the middle one and a half times as thick as the penultimate. Eyes large, convex, located at sides of head a little anterior to the middle. Thorax two and a half times longer than broad; sides straight, anterior border evenly rounded and narrowly margined;

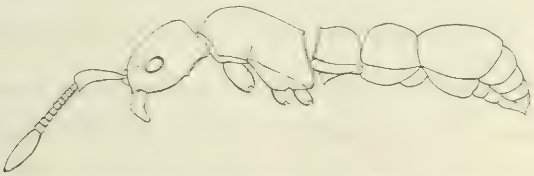


FIG. 1.— Cerapachys (Cerapachys) terricola Mann. Worker.

in profile convex above. Epinotal declivity flat, margined above and at sides. Petiole subrectangular, a little broader than long, margined in front, sides feebly rounded, anterior surface flat; in profile, about as long as high, rounded above, ventral tooth large and triangular. First gastric segment similar in shape to petiole, about a third broader; remainder of gaster less than twice as long as broad.

Mandibles sparsely punctate and shining. Head, thorax, and gaster with scattered foveolate punctures, which are more abundant and largest on the head, thoracic pleurae, and petiole, becoming contiguous on the metapleurae, more sparse on the pronotum and gaster, and lacking on epinotal declivity. The interspaces smooth and shining. Legs and antennae finely punctate and sublucid.

Head and body with fine, long, erect hairs; legs and antennae with shorter, stiffer, and semierect hairs. Blades of mandibles with brush of short pile.

Color piceous; mandibles, legs, and antennae ferruginous, tibiae partly fuscous.

Male. Length 3 mm.

Head, excluding eyes, longer than broad, narrowly rounded behind; cheeks short. Mandibles very similar to those of worker. Clypeus as in worker. Antennae short, scapes club-shaped, not extending to occipital corners; funicular joints longer than broad, gradually increasing in thickness toward apex; apical joint a little longer than the two preceding together and but slightly thicker than the penultimate. Eyes and ocelli large and convex. Promesothorax in profile strongly convex, without Mayrian furrows. Mesometanotal suture straight, distinctly impressed, scutellum convex. Epinotum convex, without distinct base and declivity. Petiole and first gastric segment similar to those of worker. Gaster thick. Genitalia prominent.

Punctation similar to that of worker, but more feebly shining. Pilosity as in worker.

Wings deeply infuscated and densely covered with short suberect hairs. Stigma dark fuscous.

Piceous; mandibles and antennae fuscous; tibiae dark testaceous.

Three Sisters: Malapaina (Type-locality). Ysabel: Fulakora.

Described from several workers and males taken from a colony situated in wet earth beneath a stone and from two workers found running on the ground. *Type.*— M. C. Z. 9,151.

The distinctly, though finely, denticulate mandibular blades and the more slender antennae distinguish *terricola* from *inconspicua* Emery. In the latter species the second funicular joint is very small; the funiculus robust, with the club barely longer than the four preceding joints. In *terricola* the club is as long as the six preceding joints.

2a. CERAPACHYS (CERAPACHYS) TERRICOLA, subsp. TULAGI, subsp. nov.

Worker. Length 3.5–4 mm.

Differing from typical *terricola* in its larger size and in the sculpture of the metathoracic pleurae and sides of petiole, where the punctures are more shallow and sparse and not confluent. In *terricola* the punctation is dense, the sides of the petiole being almost rugose in appearance.

Male. Length 3.8 mm.

Similar to male of typical form but conspicuously larger in size.

Florida: Tulagi.

One small colony found beneath a stone.

3. CERAPACHYS (CERAPACHYS) INCONSPICUA Emery.

Term. fuzet., 1902, **25**, p. 152, ☿.

Ysabel: Fulakora.

A solitary worker which agrees with Emery's description was found running on the ground.

STIGMATOMMA subgen. FULAKORA, subgen. nov.

This subgenus is proposed for those species of Stigmatomma that have the frontal lobes approximate, instead of widely separated.

Type.—S. (FULAKORA) CELATA, sp. nov.

S. armigerum Mayr, *chilense* Mayr, *saundersi* Forel, and *minuta* Forel should be included in Fulakora.

4. STIGMATOMMA (FULAKORA) CELATA, sp. nov.

Worker. Length 2.9 mm.

Head a little longer than broad; occiput shallowly concave; sides nearly straight in front, broadest at clypeus, behind somewhat rounding into moderately narrow occipital corners; a feeble suture extending from occiput to frontal lobes; clypeus in front, armed with six stout denticles. Mandibles a little less than two thirds as long as head, the thickened basal portion with five teeth, the apical three bifid; the slender apical portion with one small denticle and two minute ones near apex. Frontal lobes convergent, the carinae short, feeble, and diverging behind. Scape short, extending less than two thirds the distance to the occipital corners; all the funicular joints except the first and apical distinctly transverse; apical joint nearly twice as long as broad. Eye distinct, but minute, located at sides of head posterior to the middle. Thoracic dorsum and epinotum flat. Prothorax a little longer than broad, evenly rounded in front; sides parallel; disc at middle with a very feeble longitudinal carina. Promesonotal suture strongly impressed. Mesonotum nearly twice as broad as long, sides evenly rounded. Epinotum one and one third times longer than broad, broadest behind, sides convex at anterior half, then straight; declivity transverse, strongly margined at sides, disc shallowly concave. Petiole narrower than first gastric segment; from above a little broader than long, rounded, in front, with nearly straight sides; from the side slightly longer than deep; ventral process small, rounded in profile. Gaster slender. Legs stout.

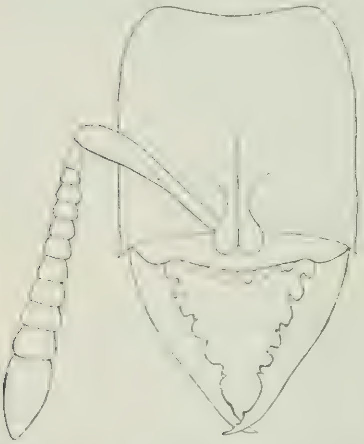


FIG. 2.— Stigmatomma (Fulakora) celata Mann. Worker. Front view of head.

Sublucid throughout. Mandibles with short coarse rugae and stiff erect hairs. Scapes, head, thorax, and petiole densely granulose, the head more so than the rest, with short, semierect pilosity. Petiole, gaster, metathoracic pleurae, and legs punctate, similar to, but more shallow than, the rest of the body; the pilosity of the gaster becoming dense toward apex.

Color rufotestaceous; the head a little darker; pilosity yellowish white.

Described from workers taken with larvae and pupae from small colonies nesting in humid forests beneath stones, on Ysabel (Fulakora Type-locality), and Malaita (Auki) and from Tulagi, Florida, and Wai-ai, San Cristoval. The specimens from Tulagi and Wai-ai are darker than the others. *Type.* — M. C. Z. 9,152.

Pupae entirely naked.

The larva is covered with fine, white, erect hairs and is very similar to that of *S. pallipes,* described and figured by Wheeler (Biol. bull., 1900, **11**, p. 61, fig. 8) but rather more slender.

5. AMBLYOPONE LEVIDENS Emery.

Ann. Mus. civ. stor. nat. Genova, 1887, **25**, p 418, ♀.

Malaita: Interior near Fourafi.

A single female agrees with Emery's description.

6. MYOPOPONE CASTANEA (F. Smith).

Amblyopone castaneus F. Smith, Journ. proc. Linn. soc. London. Zool., 1861, **5**, p. 105, pl. 1, fig. 6, ☿.

Santa Cruz: Graciosa Bay. San Cristoval: Wai-ai, Star Harbor. Florida: Tulagi. Ysabel: Fulakora. New Georgia: Lambeti.

My specimens belong to the typical form, which is widely distributed in the Papuasian and Oriental regions and occurs also in Australia.

It nests in rotten or semirotten wood, always where there is plenty of moisture. The workers are very timid and highly sensitive to and repelled by light.

7. PLATYTHYREA MELANCHOLICA (F. Smith).

Pachycondyla melancholica F. Smith, Journ. proc. Linn. soc. London. Zool., 1864, **8**, p. 71, ☿.

Santa Cruz: Graciosa Bay.

One worker.

8. RHOPALOPONE MALAENSIS, sp. nov.

Worker. Length 2 mm.

Head about a third longer than broad; sides slightly convex; occipital angles narrow, margin feebly concave. Clypeus broadly rounded in front, the surface convex. Frontal lamellae small, widely separated. Mandibles rather slender, the blades with very minute teeth. Antennal scapes extending almost to the occipital corners; funicular joints 4–9 slightly transverse. Eyes small, but distinct, situated at sides of head a little in front of the middle.

Promesothorax in profile slightly convex; from above, narrowest behind, broadest in front of middle, with rounded sides and anterior border. Promesonotal suture obsolete. Mesoëpinotal suture barely discernible. Base of epinotum quadrangular, nearly as broad as long, with straight sides, the surface convex; declivity flat, with slightly margined sides. Petiole more than twice as broad as long, narrowest in front, in profile deeper than long, rounded above. First gastric segment twice as broad as petiole; a little longer than the second segment. Legs stout.

Head, thorax, petiole, and gaster sublucid, densely pitted with coarse irregular foveae which are narrowly separated, so that the body has a reticulate appearance; clypeus longitudinally striate. Epinotum strigose with fewer foveae; declivity smooth and shining. Meso- and metapleurae coarsely, irregularly strigose. Mandibles coarsely punctate, shining. Antennae and legs sublucid, finely punctate.

Antennae pubescent. Head and body with fine erect pile. Color dark fuscous. Antennae, mandibles, and legs ferruginous. Pilosity white.

Malaita: Auki.

Described from workers taken from beneath the bark of a dead tree.
Type.—M. C. Z. 9,153.

This form approaches *R. epinotalis* Emery from New Guinea, but in that species the petiole is not punctate and the third abdominal segment is subtly punctate. In *malaensis*, the petiole is coarsely punctate, and the third abdominal segment is as coarsely so as the second. It differs also in having denticles, though very small ones, on the mandibular blades. Possibly it should be considered merely a subspecies of *epinotalis*.

The larva is slender, not tuberculate, and uniformly covered with long white hairs, which become fine and flexuous anteriorly, similar to the larvae of Stigmatomma.

The pupae are light fuscous in color.

WHEELERIPONE, gen. nov.

Type.— W. ALBICLAVA, sp. nov.
Worker. Allied to Stictoponera Mayr.

Head moderately elongate. Mandibles elongate, triangular, with small teeth on inner border. Frontal lobes small, feebly prominent and widely separated. Clypeus strongly depressed anteriorly and broadly rounded, separated from front by a feeble suture. Eyes prominent and convex, though small. Antennae slender, 12-jointed; the scape somewhat flattened at base; joints 8–11 forming a very poorly differentiated club. Thorax elongate; unarmed. Prothorax angulate ventrally at sides but without tooth. Promesonotal and mesoëpinotal sutures strongly impressed. Petiole from above, subglobose; from the side, rounded above, the anterior surface with a flattened space, anteroventral surface with flattened triangular spine. First gastric segment a little broader, but shorter than the second, armed anteroventrally. The remaining segments short, somewhat deflected, but not as strongly as in Stictoponera. Legs slender; anterior tibia with strongly pectinate spine; middle and posterior tibiae each with a single long, simple spine. Tarsal claws large, with a distinct pointed tooth basally on the inner surface.

9. Wheeleripone albiclava, sp. nov.

Worker. Length 6.5 mm.

Head a third longer than broad, broadest at occiput; sides slightly convex; occipital border shallowly and narrowly excavated. Frontal carinae very short, their lobes small, flat, as far apart as their distance to sides of head. Basal portion of clypeus slightly convex, longer than broad; anterior portion flat, the border evenly rounded. Mandibles large, elongate-triangular, the blades with 10–12 minute, widely separated teeth. Antennae slender, scapes somewhat flattened basally, surpassing occipital angles by a distance of less than their width at apex; first flagellar joint slightly longer than the second and twice as long as broad, second joint a little longer than the third; joints 3–7 subequal, subglobose in shape; joints 8–10 each a little larger than the preceding, 9–10 longer than broad; terminal joint slender, a little longer than

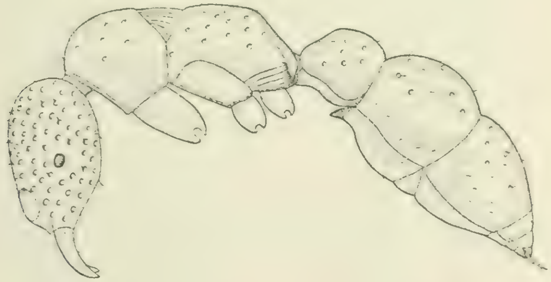


FIG. 3.— Wheeleripone albiclava Mann. Worker.

the two preceding joints together. Eyes small, but distinct, convex; located at middle of sides of head. Prothorax slightly convex, broadest in front, humeri narrowly rounded; anterior border rounded, sides nearly straight; ventral border angulate, but not armed. Promesonotal suture strongly impressed. Mesonotum more than twice as broad as long; the surface feebly convex. Base of epinotum slightly convex, little longer than broad; in profile, broadly rounding into the declivity; declivity slightly transverse, the surface convex. Petiole from above subglobose, a little longer than broad; in profile about as deep as long; anterior surface flat and margined at sides; anteroventral tooth flat, triangular. First gastric segment at base a little broader than the petiole; broader, but shorter than the second segment; the constriction between the two strong. Sting short and thick for two thirds the distance from base, then acuminate, the sides of the thickened basal portion at tip with a fine hair. Legs slender; tarsal claws with a strong tooth.

Shining: occiput, sides of head, and cheeks furrowed, the furrows containing strong, umbulate foveae, sometimes approximate, but not contiguous; middle of front and vertex with seven strong irregular carinae, the inner of which extend to the occipital border and the outer only half the distance; basal portion of clypeus bicarinate, the carinae widely separated, anterior portion densely punctulate. Mandibles feebly shining and shallowly punctate Antennae sublucid, shallowly punctate. Prothorax with a few shallow punctures on front half of dorsum, elsewhere smooth. Mesothorax with strong carinae, six on the disc longitudinal, four at sides becoming diagonal. Epinotum punctuate at upper part of sides. Metapleurae with five strong, short carinae situated apically. Petiole and first two gastric segments sparsely and shallowly foveolate. Legs sparsely punctate.

Head, body, and antennal scapes with very sparse, scattered erect hairs. Antennal funiculus pubescent.

Ferruginous throughout; funicular joints 1–7 a little lighter; joints 8–11 white. Pilosity black.

Ysabel: Fulakora.

Described from four workers found on the ground in the forest.

This very striking ant approaches in general form some of the species of Stictoponera but it differs in having very strong thoracic sutures and in not having angulate occipital corners and the gaster is much less deflected at tip. The shining integument, with its curious sculpture and the remarkable coloration of the antennae, ferruginous, with a white club in strong contrast, is quite distinctive. The club is perhaps not more pronounced than in Stictoponera, but is strongly accentuated by the color.

It is evidently rare for I searched diligently in the same vicinity without finding a nest or more workers.

10. WHEELERIPONE LUCIDA, sp. nov.

Worker. Length 3 mm.

Differing from the preceding species in the much smaller size and in the form of the petiole, which in profile is distinctly higher than long, convexly declivous in front, with the flat anterior space very poorly defined.

There are no striae on the mesonotum, which is very smooth and shining. Otherwise it is a miniature of *albiclava* in form, sculpture, and color, but with more abundant and proportionately coarser hairs on the head and body.

Malaita: Auki.

Described from a solitary worker.

11. WHEELERIPONE CRENATICEPS, sp. nov.

Worker. Length 3 mm.

Head one and a half times longer than broad, nearly as broad in front as behind, with feebly convex sides and narrowly rounded occipital corners; occipital border very shallowly and narrowly concave at middle. Mandibles stout, trigonal, the blades with indistinct widely separated denticles. Clypeus convex basally; anterior border subangulate at middle. Frontal carinae strong, parallel for half their length, then slightly diverging and becoming tortuous. Frontal area deeply impressed. Antennal scapes surpassing occipital corners by one fourth of their length; funicular joints 1–2 longer than broad, the first the longest, joints 3–7 very slightly broader than long; joints 8–11 forming a rather slender club with the terminal joint almost as long as the other three together. Prothorax broader than long, rounded in front and sides; in profile convex in front and rather flat behind. Promesonotal suture very feebly impressed. Mesonotum more than twice as broad as long, flat

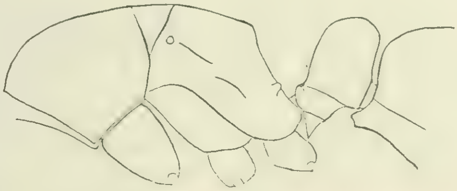


FIG. 4.— Wheeleripone crenaticeps Mann. Worker. Lateral view of thorax and petiole.

above. Epinotum as broad in front as behind, one and a half times longer than broad; basal surface flat. Petiole very little broader than long, evenly rounded in front and at sides; posterior border straight; node in profile, higher than long, rounded above, declivous behind and nearly so in front; the anteroventral spine large. First gastric segment broader than long and noticeably shorter than the second. Legs slender.

Head sublucid, the front and vertex with coarse, sinuous carinae, and the spaces between those with coarse, foveolate punctures; sides foveolate, the interspaces smooth and shining. Clypeus bicarinate and finely punctate. Mandibles sublucid; coarsely but shallowly punctured. Antennae more finely punctate. Thorax shining, sparsely punctate, the punctures foveate, but more shallow than those of the head. Petiole and gastric segments punctate even more sparsely and shallowly. Metapleurae transversely striate apically. Legs shining, with sparse punctation.

Head and body with fine erect hairs.

Color dark brown; antennae and legs lighter.

Ysabel: Fulakora.

Described from several workers taken from a colony beneath a stone. *Type.* — M. C. Z. 9,154.

Key.

Length 6 mm. Mesonotum strongly striate; petiole in profile longer than high .... *albiclava* Mann.

Length 3 mm. Mesonotum not striate; petiole in profile not longer than high .... 1.

1. Last four funicular joints white; promesonotal suture stronger; prothorax smooth and shining; anterior face of petiolar node shorter than dorsal surface and broadly rounding into it .... *lucida* Mann.

Antennae unicolored; promesonotal suture weaker; prothorax heavily punctate; anterior face of petiolar node longer than dorsal surface and narrowly rounding into it .... *crenaticeps* Mann.

12a. RHYTIDOPONERA (RHYTIDOPONERA) ARANEOIDES Le Guillou, var. FROGGATTI Forel.

Rev. Suisse zool., 1910, **18**, p. 10, ☿ .

Male. Length 7–8 mm.

Head, longer than broad, as broad in front as behind, with rounded occiput. Eyes and ocelli very large and convex; cheeks a fifth as long as eye. Clypeus convex, flattened anteriorly, the border evenly rounded. Mandibles stout, dentate similar to those of worker. Antennal scape extending two thirds the distance to occipital corners. First flagellar joint one fifth the length of the second, which is as long as the scape; joints 3–12 gradually shorter than the preceding; terminal joint slightly longer than penultimate. Thorax robust; scutellum prominent, convex, a little broader than long. Declivity of epinotum longer than the base and flattened. Petiole more than twice as long as high, convex above at middle, from above, longer than broad, sides slightly convex. Genitalia not prominent.

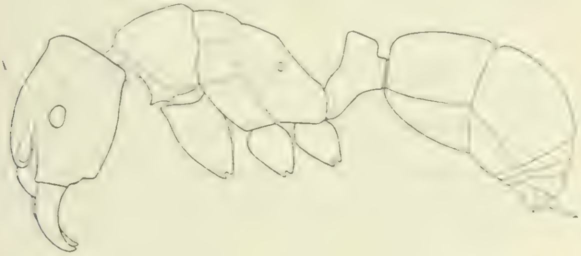


FIG. 5.— Rhytidoponera (Rhytidoponera) araneoides froggatti Forel. Worker.

Shining, head and thorax irregularly, rugosely sculptured. Epinotum and petiole transversely strigose. First segment of gaster very densely and finely arcuately striate; striae of second segment similar, but more concentric. Mandibles longitudinally strigose.

Head and body with moderately abundant fine, erect hairs.

Color fuscous throughout; mandibles, antennae, and tarsi paler. Pilosity black.

Wings (length 5.7 mm.) infuscated.

Ysabel: Fulakora. San Cristoval: Pamua, Wainoni Bay. Ugi: Pawa. Florida: Tulagi, Maliali. Malaita: Auki, near Fourafi, in the interior. Rendova.

There appear to be no local varieties of this species which ranges throughout the group. Probably it is confined to the British Solomons, for it is very common where it occurs and would have been recorded from further east if found there. I did not find any other species of this genus, which is well developed in New Guinea.

R. froggatti lives generally in or beneath hollow logs lying on the ground, sometimes in colonies numbering several hundred but more frequently with less. It is a timid species, hustling its dark brown pupae and the larvae into the nearest shelter and huddling there when the nest is disturbed. Those individuals not completely hidden remain motionless. It is fond of plant-juices and workers are commonly seen on smaller plants.

Excepting the uniformly larger size and the black color, I can detect no difference that will separate the workers of *froggatti* from *araneoides* described originally from Bougainville.

13. DISCOTHYREA CLAVICORNIS Emery.

Term. fuzet., 1897, **20**, p. 593, pl. 15, fig. 39, 40, ☿.

A small colony containing three females and a dozen workers was found beneath a log in a swamp near Fulakora, Ysabel. The worker is more active than those species of Proceratium and Sysphincta that I have seen. The rich brownish red color, with the microscopic silky pubescence give the living insect an elegant, shagreened appearance.

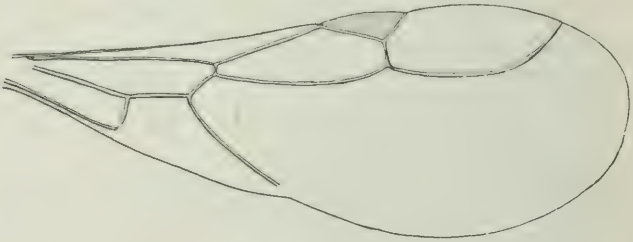


FIG. 6.— Discothyrea clavicornis Emery. Wing of female.

The female measures 2 mm. in length and is rather more robust, but otherwise similar to the worker, except for the usual sexual differences. The eyes are larger and somewhat convex. The ocelli are distinct, arranged in an equilateral triangle. The wings (length 2 mm.) are hyaline and densely covered with fuscous hairs; veins and stigma are fuscous.

14. ECTOMOMYRMEX EXARATA Emery.

Term. fuzet., 1902, **25**, p. 156, ☿.

I am referring to this species three workers. The mandibles are heavily strigose, with 6–7 teeth on the blades. The third funicular joint is longer than broad and the remaining joints are as long as broad. In the closely related *E acuta* Emery the third joint is described as being as long as broad, the remaining apical joints, except the terminal are transverse and the mandibular blades have only five teeth. The two species are evidently very closely related and it is probable that Forel's *dahli* from the Bismarck Archipelago is only a subspecies of, if not identical with, *exarata*.

In the specimens before me the first gastric segment is heavily strigose longitudinally and the second segment is much more delicately sculptured, as described in the three forms mentioned above.

Ysabel: Fulakora.

14a. ECTOMOMYRMEX EXARATA Emery, subsp. AEQUALIS, subsp. nov.

Worker. Length 6–6.5 mm.

Differing from the typical form in its somewhat smaller size and in having the striae of the second gastric segment not appreciably finer than that of the first, though with fewer punctures between.

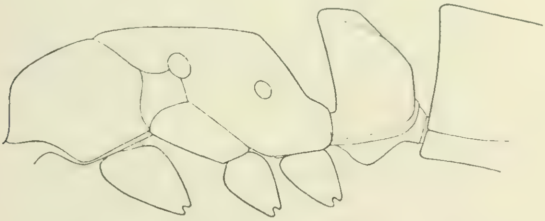


FIG. 7.— Ectomomyrmex exarata aequalis Mann. Worker. Lateral view of thorax and petiole.

Described from several workers taken at Auki, Malaita and one at Tulagi, Florida. The Auki specimens were together and evidently belonged to the same colony, but I was unable to locate the nest. *Type.*—M. C. Z. 9,155.

The species of Ectomomyrmex in their timid behaviour are similar to Bothroponeta.

15. EUPONERA (MESOPONERA) PAPUANA Viehmeyer.

Zool. jahr., 1914, **37**, p. 608, ☿.

Worker. Length 6.5–8 mm.

Head one and three fourth times longer than broad, as broad in front as behind; sides subparallel; occipital angles narrowly rounded, the border feebly concave. Clypeus very broadly and prominently carinate, the anterior border angulate at middle. Mandibles long and slender, with eleven stout teeth. Frontal carinae very short; their lobes little dilated and flat; the narrow frontal depression extending less than half the distance to occipital border. Antennae long and slender; scapes surpassing occipital corners by a distance equal to twice their breadth at apex; first and second funicular joints subequal, three times longer than broad; third joint shorter than second and proportionally broader, joints 4–10 longer than broad, subequal in length but increasing in thickness toward apex; terminal joint barely as long as the two preceding joints together. Eyes small, very flat, situated in front of sides of head at a distance of three times their diameter from base of mandibles. Prothorax convex, a little broader than long, narrowly rounded at front and sides; anteroventral corners broadly rounded. Premesonotal suture strongly, but less profoundly impressed than the mesoëpinotal. Epinotum in profile as long as prothorax, depressed at middle, with a narrow, transverse impression slightly posterior to spiracles; angle between base and declivity broadly rounded and strongly longitudinally impressed at middle, the sides standing out as rounded margins; declivity flat. Petiole squamiform, twice as high as long, narrowly rounded above; anterior surface convex, posterior flat; submarginate above and at sides of posterior border. Gaster long and slender. Legs very long and slender. Sting slender.

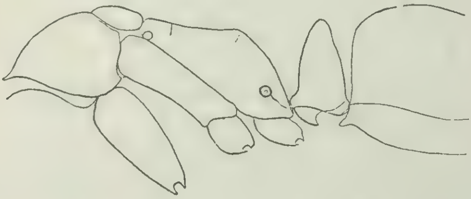


FIG. 8.— Euponera (Mesoponera) papuana Viehmeyer. Worker. Lateral view of thorax and petiole.

Sublucid. Head, body, mandibles, antennae, and legs finely, reticulately punctate and microscopically pubescent; the punctation and pubescence of the epinotum and petiolar node less conspicuous than on other parts; pronotum with two long, erect hairs.

Color ferruginous throughout; legs lighter than the rest.

San Cristoval: Wai-ai. Ysabel: Fulakora.

Described from workers taken with larvae from a small colony in a rotten log.

This is the only form of this species described from the Papuan region; a female of an undetermined species from New Guinea has been recorded by Emery, and other species undoubtedly occur there, as *E. melanaria* Emery with its subspecies is found in the Oriental and Malayan regions and occurs also in Australia.

Euponera papuana is sharply distinct from the related species in the very long, depressed epinotum, with the longitudinal impression at the apical part of base. It is much larger than *rubra* F. Smith from Singapore and Java, and more slender than *melanaria* subsp. *australis* Forel, from Australia.

16a. EUPONERA (BRACHYPONERA) LUTEIPES Mayr, var. CROCEICORNIS Emery.

Term. fuzet, 1900, **23**, p. 315, ☿.

Ysabel: Fulakora.

Several workers were found beneath bark.

17a. EUPONERA (TRACHYMESOPUS) STIGMA Fabricius, var. QUADRIDENTATA (F. Smith).

Ponera quadridentata F. Smith, Journ. proc. Linn. soc. London. Zool., 1859, **3**, p. 143.

Santa Cruz: Graciosa Bay. San Cristoval: Wai-ai, Pamua, Wainoni Bay. Ugi: Pawa. Malaita: Auki. Florida: Tulagi. New Georgia: Lambeti. Rubiana Lagoon. Ysabel: Fulakora.

This is as common throughout the Solomons as the typical form is in the Neotropical region. Both species nest in small colonies in rotten wood or beneath bark.

18. EUPONERA (TRACHYMESOPUS) SHELDONI, sp. nov.

Worker. Length 3.75 mm.

Head a little longer than broad, with feebly convex sides and narrowly rounded occipital corners; occipital border narrowly but rather deeply concave at middle. Clypeus broadly rounded in front; strongly carinate at middle, the carina produced in front to form a strong, blunt spine. Mandibles with six stout, triangular teeth. Frontal lobes triangular, flat; the frontal impression between extending to occipital border. Antennal scapes not reaching occipital corners; the funicular portion without trace of club; the joints except first and terminal gradually increasing in size, each only slightly transverse. Eyes very minute; located in front of sides at about one fifth the distance from mandibles to occipital corners. Prothorax a little broader than long; rounded above, in front, and at sides. Mesothorax transversely oval; in profile almost flat. Promesonotal and mesoëpinotal sutures strongly impressed. Base of epinotum flat, broadest at middle, as broad in front as behind; declivity flat, roundly margined at sides. Petiolar node thick; in profile highest at front, anterior surface concave, apex gradually sloping into the front surface and broadly rounding into the convex posterior surface: from above, rounded at front and sides, straight behind, semicircular in shape; less than twice as broad as long. Basal surface of first gastric segment flat. Constriction between first and second segments strong.

Head, thorax, and epinotum somewhat shining; petiole and gaster more strongly shining. Mandibles sparsely punctate; head and antennae densely punctate. Punctation of thorax, abdomen, and legs similar to that of head but much more shallow.

Head and body with silky pubescence which is most abundant on head and gaster and lacking on petiolar node; everywhere with sparse, very fine erect pile.

Color brownish yellow; vertex with a small fuscous spot; and tarsi and mandibles a little darker.

San Cristoval: Wainoni Bay.

Described from one worker.

Related to *E.* (*T.*) *crassicornis* Emery, known only from a female from New Guinea, but the petiole is much longer than deep and the thorax is not shining and the funicular articles 2–4 are not much broader than long.

Dedicated to Frederick Sheldon, in whose memory the Sheldon Travelling Fellowships of Harvard University were established.

19. CRYPTOPONE MAYRI, sp. nov.

Worker. Length 2.5–2.75 mm.

Head a little longer than broad, slightly narrowed in front, with moderately convex sides, broadly rounded occipital corners and shallowly concave border. Base of clypeus carinate at middle, anterior border feebly rounded. Front with an acute median carina. Mandibular blades with five stout triangular teeth. Antennae stout, their scapes thickened distally, extending nearly four fifths the distance to occipital corners; club distinctly longer than remainder of funiculus, middle joints strongly transverse; terminal joint longer than the two preceding joints together. Eyes absent. Prothorax slightly convex above, submargined in front and at sides. Mesothorax flattened, transverse. Promesonotal and mesoëpinotal sutures distinctly impressed. Base of epinotum flat, about as long as the declivity, which is flat and margined above at sides. Petiolar node thick, two thirds as long as high, anterior surface slightly concave, and narrowly margined at sides; upper surface broadly rounded; posterior surface rather flat, evenly rounding into the dorsal surface. Gaster long and slender.

Mandibles shining, sparsely punctate. Head, prothorax, and antennae densely punctate and opaque. Mesothorax, epinotum, gaster, and legs equally densely but more shallowly punctate and somewhat shining.

Pruinose pubescence and sparse erect pile on head and body.

Yellowish brown; head fuscous.

Female. Length 3 mm.

Similar to worker. Eyes large and flat, situated at a distance equal to half their length from front of head. Ocelli small. Wings (length 3 mm.) strongly infuscated.

Ysabel: Fulakora (Type-locality). Ugi: Pawa. San Cristoval: Wai-ai, Wainoni Bay, Pamua.

Occurs in small colonies beneath stones. In the absence of eyes *C. mayri* is distinct from the three described Papuasian species and more closely related to *testacea* Motsch. from Ceylon. It differs from that species in having the head longer, with the sides much less convex, judging from Emery's figure (Ann. Soc. ent. France, 1893, **62**, pl. 6, fig. 3). *Type.* — M. C. Z. 9,156.

C. fusciceps Emery, besides having distinct though minute eyes, is smaller in size, but is otherwise similar in habitus to *mayri*, and evidently resembles the following variety.

19a. Cryptopone mayri Mann, var. fuscior, var. nov.

Worker. Length 2 mm.

Differing from the preceding only in its smaller size and in the color, being dark fuscous almost black with the anterior border of head, mandibles, borders of gastric segments, and appendages brown.

Ysabel: Fulakora.

Described from two workers.

Key to Papuasian Species.

Eyes absent...1.
Eyes present, though minute......................................2.
1. Length 2.50–2.75 mm. Color yellowish brown. (Solomons) *mayri* Mann.
Length 2 mm. Color mostly black. (Solomons)..*mayri* var. *minor* Mann.
2. Mesoëpinotal suture distinct, mandibles 5-dentate. Length $1\frac{2}{3}$–$1\frac{4}{5}$ mm. (New Guinea).......................................*fusciceps* Emery.
Mesoëpinotal suture indistinct; head longer. Mandibles with three to four strong teeth...3.
3. Antennal scapes extending less than two thirds the distance to occipital corners; mandibles with three large teeth anteriorly and obtusely dentate posteriorly. Length 1–1.2 mm. (New Guinea)..*mocsaryi* Czabo.
Antennal scapes extending more than two thirds the distance to occipital corners; head a fourth longer than broad; mandibles with four teeth in front, edentate behind. Length $1\frac{2}{3}$–$1\frac{3}{4}$ mm. (New Guinea). *tenuis* Emery.

20. Ponera gleadowi Forel, subsp.

San Cristoval: Pamua.

A unique worker belongs to a subspecies of *gleadowi* near, if not identical with subsp. *decipiens* Forel from Hawaii.

21. Ponera pruinosa Emery.

Term. fuzet., 1900, **23**, p. 316, 319, pl. 8, fig. 13, 14, ☿.

Female. Length 3.5 mm.

Scarcely larger than the worker. The eyes are a little more than a fourth as long as the head, situated at a distance equal to half their length from the clypeus. The wings (length 3.25 mm.) are faintly infuscated, and densely pubescent; veins and stigma fuscous.

Male. Length 2½ mm.

Head, excluding the eyes, as broad as long, broadly rounded behind. Mandibles feeble, short, triangular, and edentate. Clypeus strongly elevated at middle, the anterior border narrowly concave at middle. Antennae long and slender; first funicular joint scarcely longer than broad, a little more than half the length of the scape; 2nd joint two and three fourths times as long as the first; joints 3–11 subequal, cylindrical; terminal joint one and a half times as long as penultimate. Eyes and ocelli large, the former moderately convex. Epinotum broad; in profile convex basally; declivous portion sloping, with the surface flat discally, broadly rounded at sides. Node shorter than that of worker; anterior face convex, rounded above, declivous behind. Gaster markedly constricted between first and second segments. Genitalia small.

Color and pubescence similar to that of worker; pilosity more abundant. Wings not infuscated, pubescent similarly to those of female.

Three Sisters: Malapaina. San Cristoval: Wainoni Bay, Wai-ai, Pamua. Ugi: Pawa. Malaita: Auki. Florida: Tulagi. Ysabel: Fulakora.

A large series of workers agree closely with Emery's description of workers from New Guinea. It is the commonest species of the genus in the Solomons.

22. PONERA PAPUANUM Emery.

Term. fuzet., 1900, **23**, p. 319, pl. 8, fig. 10–11, ☿.

Three Sisters: Malapaina. San Cristoval: Wai-ai. Ugi: Pawa. Ysabel: Fulakora.

A small series of workers and females which I refer to this species agree closely with Emery's description.

The wings of the female are strongly infuscated, with the veins and stigma dark.

23. PONERA PALLIDULA Emery.

Term. fuzet., 1900, **23**, p. 316, 320, pl. 8, fig. 17, 18, ☿.

Malaita: Auki. Ysabel: Fulakora.

A deälated female taken in a colony is barely larger than the worker.

24. Ponera clavicornis Emery.

Term. fuzet., 1900, **23**, p. 317, pl. 8, fig. 7, 8, ☿.

Ysabel: Fulakora.

25. Leptogenys (Leptogenys) truncatus, sp. nov.

Worker. Length 6.5 mm.

Related to *L. emeryi* Forel. Head slightly longer than broad, occipital angles broadly rounded, border straight. Frontal carinae short, their lobes small. Clypeus strongly and acutely carinate at middle, projecting in front, the projected portion twice as broad as long with a feebly biconvex border. Mandibles shorter than sides of head. Antennal scapes slightly surpassing the occipital corners; funicular joints one and three subequal in length and shorter than the second; joints four to ten subequal; terminal joint a little less than twice the length of penultimate. Prothorax broader than long; rounded in front and at sides; in profile only slightly convex above. Mesothorax a little broader than long, the sides and front rounded. Mesoëpinotal impression profound. Epinotum convex, broadest behind; in profile the basal portion is one and two third times as long as the declivity. Petiole very slightly longer than broad; in profile, slightly higher than long, rounded in front and at top; posterior surface flat. Gaster slender; constriction between first and second gastric segments not strong.

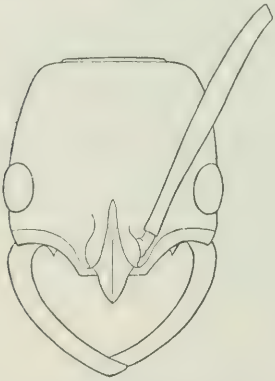


Fig. 9.— Leptogenys (Leptogenys) truncatus Mann. Worker. Head showing epinotum and clypeus.

Shining. Front rugulosely punctate, vertex at middle with short transverse and reticulate carinulae; remainder of head, thorax, epinotum (except declivity), and petiole with coarse foveolate punctures which are more dense and confluent on the epinotum than elsewhere. Epinotal declivity transversely striate. Gaster more shallowly punctate. Mandibles and antennae shining, punctate.

Pilosity long and fine, abundant; erect on head and body, semierect on antennae. The femora and tibiae have, in addition to semierect pile, finer and recumbent pilosity.

Color black; legs and antennae lighter; mandibles red. Pilosity yellowish white.

Santa Cruz: Graciosa Bay.

The description is based on a single worker. This species is closely related to *emeryi* Forel from the Bismarck Archipelago, but the clypeus is entirely different, with the middle projection bisinuate instead of trisinuate.

26. LEPTOGENYS (LEPTOGENYS) FORELI, sp. nov.

Worker. Length 6.5–7 mm.

Head a little broader than long, broadest in front, posterior border straight. Mandibles about as long as sides of head, strongly curved basally and then slightly arcuate and of even thickness to tips. Clypeus sharply carinate at middle; median lobe longer than broad, with sides parallel for half their length, then slightly concave and converging to form a triangular pointed tip; lobes on either side of middle broadly rounded. Antennal scapes surpassing occipital corners by about one third of their length; first and third joints subequal; terminal joint shorter than the two preceding joints together. Thorax broadly and shallowly impressed between meso- and epinotum. Base of epinotum convex above, much longer than the declivity (in *emeryi* Forel but little longer) and rounding into it. Petiolar node slightly broader than long, convex above, highest behind, with straight posterior and nearly straight anterior surfaces.

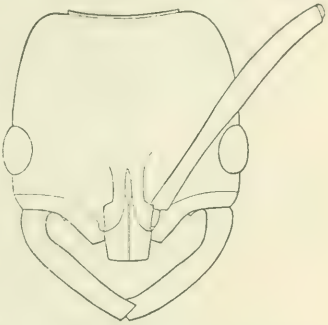


FIG. 10. — Leptogenys (Leptogenys) foreli Mann. Worker. Head showing epinotum and clypeus.

Head and thorax subopaque. Mandibles striate. Head rugose and with coarse foveolate punctures scattered on front and occiput. Pro- and mesonotum coarsely, foveolately punctate, the interspaces finely rugulose and more shining than the rest. Epinotal declivity transversely striate, the base and the petiolar node rugose. Gaster shining, with two sizes of punctures. Scapes and legs finely punctate.

Long erect pilosity abundant everywhere.

Black; mandibles, antennae, apex of gaster, tibiae, and tarsi reddish brown.

Male. Length 6.5 mm.

Head a little longer than broad, broadly and evenly rounded behind. Mandibles small and spatulate. Clypeus with an elongate tubercle a little in front of middle; anterior border feebly arcuate at middle. Eyes and ocelli large. Antennae slender; scape twice as long as first funicular joint, which is about as broad as long; remaining joints becoming very gradually shorter toward apex; terminal joint one and one third times as long as the preceding joint, the apical third of it conical in shape. Prothorax in profile a third as long as mesothorax. Mesothorax flattened distally, with strong Mayrian furrows. Scutellum strongly convex, a little broader than long. Epinotum rounded above, disc of the declivous portion flat. Petiolar node in profile as long as high, anterior face convex and broadly rounding into the top, posterior surface flat; from above, as long as broad, rounded in front and at sides, truncate behind. A strong constriction between first and second gastric segments.

Somewhat shining. Head and prothorax striolate rugulose. Mesothorax and scutellum with similar sculpture and strongly and foveolately punctate. Epinotum coarsely rugose. Petiolar nodes coarsely striate at sides and heavily punctate throughout. Gaster finely punctate.

Head and legs with long and silky recumbent hairs. Pilosity abundant; on the gaster longer and less erect.

Color black; mandibles, antennae, geniculae, and tarsi brown. Wings infuscated; veins and stigma brown.

Three Sisters: Malapaina (Type-locality). Malaita: Auki, Simoli (Coll. H. Hall).

Closely related to *emeryi* Forel, from the Bismarck Archipelago, from which it differs in the structure of the epinotum and the clypeus.

Key to the Papuasian Species of the Subgenus Leptogenys.

1. Length 12 mm. Head distinctly longer than broad, with scattered piligerous punctures. Postpetiole and gaster rufous. (New Guinea). *triloba* Emery.

   Length 5 to 8 mm. Head not or but slightly longer than broad, rugosely punctate. Gaster black, sometimes with bluish reflections, rufous apically . . . . .2.

2. Mandibles distinctly longer than sides of head. Petiole much longer than broad. Lobe of clypeus elongate and rounded apically. Length 7.5–8 mm. (Engano) . . . . *modiglianii* Emery.

   Mandibles not longer than sides of head. Petiole at least as broad as long . . . . .3.

3. Lobe of clypeus broad and trisinuate in front. Base of epinotum but little longer than the declivity. Length 5.8 mm. (Bismarck Archipelago). *emeryi* Forel.

   Lobe of clypeus not trisinuate in front. Base of epinotum much longer than the declivity . . . . .4.

4. Lobe of clypeus broader than long, broad in front and slightly concave at middle of border. Length 6.5 mm. (Santa Cruz) . . . . *truncata* Mann.
Lobe of clypeus longer than broad and pointed apically. Length 6.5–7 mm. (Solomons) . . . . *foreli* Mann.

27a. LEPTOGENYS (LOBOPELTA) DIMINUTA (F. Smith), subsp. SANTSCHII, subsp. nov.

Worker. Length 6.25 mm.

Differing from the typical *diminuta* in its somewhat more slender habitus and in the following characters:—the mesoëpinotal impression is narrower. The mesopleurae are strongly, densely, and accurately striate. The epinotal base is not as rugose as the declivity, which has regular, transverse, and parallel striae, stronger than in *diminuta* and not interrupted by the lateral tubercles. The latter are much smaller than in *diminuta* so the declivous surface is broader at the base. The petiolar node is higher in proportion to the length.

The front of head has arcuate striae as in *diminuta*. The body, node, and gaster are shining.

Female. Length 7.5 mm.

One specimen among a very large series, has the gaster longer and more enlarged than the others and evidently represents the sexual phase. The petiole is very slightly thinner in profile than in the ordinary workers, but otherwise there is no difference in structure.

Male. Length 5 mm.

Head, excluding eyes, longer than broad. Mandibles short and bluntly pointed. Clypeus large and convex, the anterior border slightly concave at middle. Antennal scape more than twice as long as the first funicular joint; second funicular joint three and one half times as long as the first; succeeding joints gradually becoming shorter; terminal joint one and five eighths times as long as the preceding. Eyes and ocelli large and prominent. Prothorax little convex above. Scutellum longer than broad. Epinotum convex basally, the declivous portion flat. Petiolar node in profile longer than high; seen from above, circular in shape. First and second gastric segments with a strong constriction between.

Feebly shining; head punctate and finely striolate; the striolae surrounding the ocelli coarser than elsewhere. Thorax rugulosely striate, the striae on apical half of mesothorax converging toward the center; those on scutellum longitudinal and finer. Epinotum granulosely punctate. Petiolar node and gaster finely and sparsely punctate and shining. Femora densely and rather coarsely punctate. Clypeus and legs with semierect pile.

Color fuscous; with mandibles, antennae, and geniculae lighter. Wings (length 4 mm.) hyaline, with semierect and moderately long hairs; veins and stigma pale.

Three Sisters: Malapaina (Type-locality). San Cristoval: Wai-ai, Pamua. Ugi: Pawa.

Type.—M. C. Z. 9,157. On several occasions I found masses of workers, accompanied by males, swarming on the ground, always in the forest, and numerous larvae and pupae beneath pieces of bark lying on the ground. Probably these were temporary nesting places.

This form was found only in the eastern end of the Solomons.

27b. Leptogenys (Lobopelta) diminuta (F. Smith), var. laeviceps (F. Smith).

Ponera laeviceps F. Smith, Journ. proc. Linn. soc. London. Zool., 1858, **2**, p. 69, ☿.

Malaita: near Fourafi, in the interior.

A small series of workers taken running in file on the ground, across a trail, evidently belong to this variety.

28. Anochetus graeffei Mayr.

Verh. K. K. zool.-bot. gesellsch. Wien, 1870, **20**, p. 961, ☿.

Santa Cruz: Graciosa Bay.

One dead and broken worker of this widely distributed Polynesian species was found.

29a. Anochetus punctiventris Mayr, subsp. oceanicus Emery.

Ann. Mus. civ. stor. nat. Genova., 1884, **21**, p. 378, ☿ (*nec.* Mayr).

San Cristoval: Wainoni Bay, Wai-ai, Pamua. Malaita: Auki. Florida: Tulagi. New Georgia: Maravo Lagoon.

There is some variation among workers from the same colony in the shape of the petiole, which in some specimens is more rounded above than in others. Three females among my specimens have the upper border distinctly emarginate at the center.

30. ANOCHETUS CATO Forel.

Mitt. Mus. zool. Berlin, 1901, **2**, heft 1, p. 6, ☿.

Rendova.

The workers of a single colony taken from a rotten log, agree throughout with Forel's description of this species, which is characterized by its rounded epinotal corners, the short conical projection at the apex of the petiolar node and the structure of the mandibles which are sharply angulate at a short distance posterior to the long, terminal teeth.

The sculpture on the front of head is dense, and extends outward from the frontal carinae.

30a. ANOCHETUS CATO Forel, var. SUBFASCIATUS, var. nov.

Worker. Length 5.–5.25 mm.

Similar to the typical form in size, structure, and sculpture but black in color, with the cheeks, clypeus, mandibles, legs, and a narrow apical band on each gastric segment, brown.

Female. Length 7.25 mm.

Epinotum strongly striate transversely; eyes not large; ocelli small. Wings weakly infuscated; veins and stigma brown. Otherwise similar to the worker.

Male. Length 4 mm.

Head, excluding eyes as broad as long; the medial portion of vertex on each side with longitudinal sulcae which diverge and extend to the eyes. Mandibles rudimentary. Antennae 13–jointed, rather thick; scape less than twice as long as first flagellar joint, which is a little longer than broad; flagellar joints two to six subequal, only a little more than twice as long as broad; remaining joints, except the terminal, subequal; terminal joint shorter than the two preceding together; conical. Prothorax evenly rounded at front and sides, its disc not very convex. Scutellum transverse. Epinotum convex; the base rounding into the short declivity. Petiolar node, in profile, wedge-shaped; thin and narrow above; seen from the front, not produced above, but evenly rounded; anterior surface concave; narrowly margined at sides. Pygidium acuminate apically.

Somewhat shining. Head and thorax evenly, rather coarsely punctate. Epinotum rugose. Node and gaster more sparsely punctate.

Finely pilose throughout; antennae densely covered with short stiff recumbent hairs.

Color black. Wings faintly infuscated; veins and stigma brown.

Three Sisters: Malapaina (Type-locality). San Cristoval: Wai-ai. Ugi: Pawa. Malaita: Auki. Florida: Tulagi. Ysabel: Fulakora.

Type.—M. C. Z. 9,158.

30b. ANOCHETUS CATO Forel, ISOLATUS, subsp. nov.

Worker. Length 6.5 mm.

Differing from *A. cato* Forel in the following characters: — the petiolar node in profile is thicker, more conical and blunter at apex; the anterior surface is evenly convex and not constricted before the apex as in *cato*.

The striation on the front of head is feebler and sparser and extends barely past the ends of the frontal carinae and is included between them.

The head, thorax, and epinotum are black, the gaster, legs, mandibles, and antennae, brownish red.

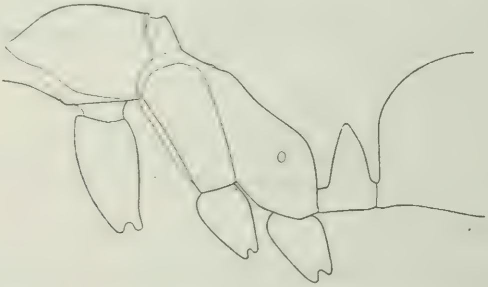


FIG. 11.— Anochetus cato isolatus Mann. Worker. Lateral view of thorax and petiole.

Male. Length 5 mm.

In addition to its much larger size, differing from the male of *cato* in the structure of the petiolar node, which in profile is nearly as broad as long and much less narrowed above.

The wings are less infuscated than in *cato*.

Santa Cruz: Graciosa Bay (Type-locality). Three Sisters: Malapaina.

Several small colonies were found in the first named locality and solitary workers in the last. *Type.*—M. C. Z. 9,159.

Key to the Species (Workers) from New Guinea and the Solomons.

Mandibular blades at $\frac{3}{5}$ distance from apex to base with an erect and acute tooth; epinotum bidentate. Length $4\frac{1}{2}$–5 mm. (New Guinea). *chirichinii* Emery.

Mandibular blades with acute teeth at the middle; epinotum angulate or rounded..1.

1. Petiolar node strongly transverse; in profile narrow and wedge shaped; seen from front rounded, truncate or concave above; epinotum angulate between base and declivity. Length 3.5–5 mm....................2.

Petiolar node in profile conical or subconical; epinotum rounded between base and declivity. Length 6–7 mm............................3.

2. Basal gastric segment not coarsely punctate............*graeffei* Mayr.

Basal gastric segment coarsely punctate. *punctiventris* Mayr subsp. *oceanicus* Emery.

3. Striation on front of head not dense; extending only slightly beyond ends of frontal carinae and confined between them; bicolored. (Santa Cruz: eastern Solomons)................*cato* Forel subsp. *isolatus* Mann.

Striation on front of head dense, covering most of the front, and extending two thirds the distance to occipital border and not confined between frontal carinae..4.

4. Ferruginous (New Britain and western Solomons)..........*cato* Forel.

Mostly black (Solomons)..........*cato* Forel var. *subfasciatus* Mann.

31. ODONTOMACHUS HAEMATODA (Linné).

Syst. nat., ed. 10, 1758, 1, p. 582, ☿.

Santa Cruz: Graciosa Bay. San Cristoval: Pamua, Wainoni Bay. Three Sisters: Malapaina. Ugi: Pawa. Russell: Yandina. Malaita: Auki, Simoli (Coll. H. Hall). Florida: Tulagi, Maliali. Ysabel: Fulakora.

As abundant in the Solomons as it is in all other tropical countries.

32a. ODONTOMACHUS IMPERATOR Emery, subsp. EMERYI, subsp. nov.

Worker. Length 14.5–15.5 mm.

Head, and gaster black, mesothorax dark brown; prothorax, epinotum, petiole, mandibles, antennae, and legs yellowish brown, the tarsi darker than the other parts.

Mandibles densely and finely striolate and with elongate punctures. Front of head between frontal carinae longitudinally striate; remainder of front except between eyes and antennae, strongly and concentrically striate; lateral fossae at the anterior border with short striae, but most of the surface smooth and shining; vertex and sides densely striate, the striae becoming more subtle posteriorly and lacking for a short distance from the sides of the medial impression; occiput sparsely punctate and shining. Prothorax transversely and somewhat arcuately striate; meso- and epinotum transversely striate. Base of petiolar node striate. Gaster finely punctate and shining.

Female. Length 19 mm.

Mesonotum and scutellum with strong longitudinal striae.

Anterior portion of prothorax, a discal spot, disc of mesothorax and anterior face of scutellum fuscous. The rest as in worker, with the usual sexual differences.

Wing (length 12 mm.) faintly infuscated; veins and stigma brown.

Male. Length 12 mm.

Head, excluding eyes, longer than broad, broadly rounded behind. Mandibles rudimentary. Clypeus convex, the anterior border almost straight. Antennal scape thick, three times as long as the first funicular joint; funicular joints, except the first, very long and slender; the second three times as long as the scape; remaining joints gradually shorter; with the terminal joint less than twice as long as the penultimate. Eyes emarginate on inner border. Ocelli large and prominent. Mesonotum little convex above. Scutellum a little broader than long, somewhat pyramidal in shape, with a short, longitudinal impression at apex. Epinotum slightly convex basally, with a well-marked declivous portion. Petiole two and a half times as long as broad; in profile twice as long as high; anterior face concave, narrowly margined at sides; upper surface elevated into a flat projection that is strongly and sharply margined on its posterior face; spiracles on sides situated at tips of strong, elongate tubercles. Gaster long and slender.

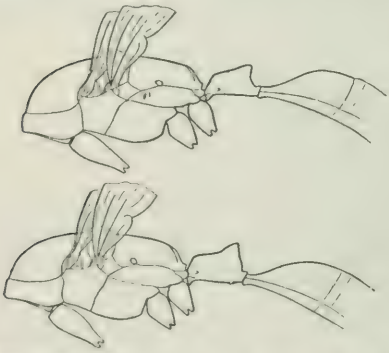


Fig. 12. — Odontomachus imperator emeryi Mann. Males. Lateral views showing variations in petiole.

Subopaque. Head, pro- and mesothorax, and scutellum delicately striolate and punctate. Epinotum more strongly, obliquely longitudinally striate.

Petiole densely and microscopically punctate. Gaster shining and finely punctate.

Head, thorax, and gaster with short and subappressed golden pubescence and a few longer erect hairs.

Color yellow. Wings faintly yellowish; veins pale.

Florida: Maliali (Type-locality). Ysabel: Fulakora.

Differing from *imperator* subsp. *rufithorax* Emery in color, not having the thorax and epinotum "rouge sanguin," and in the sculpture of the head; and from subsp. *opaculus* Viehmeyer, in color.

The yellow male is very Ichneumon-like. The two specimens, taken from the same colony, show a marked difference in the structure of the petiolar node. In one the dorsal surface gradually slopes to and up the sides of the triangular projection; in the other there is an angle between the two. The lateral tubercles on the node are unusually large.

Several colonies were observed. They were in dense forest; the nests were in the ground among the roots of trees and contained large numbers of workers. The workers are less active than *haematoda* and not as aggressive. *Type.*—M. C. Z. 9,160.

33a. ODONTOMACHUS MALIGNUS F. Smith, subsp. TUBERCULATUS Roger.

Berl. zeitsch., 1861, **5**, p. 28, ☿.

Santa Cruz: Graciosa Bay. Malaita: Simoli (Coll. H. Hall).

A large series of workers agree with Roger's description of *tuberculatus* in having the mesonotum longitudinally striate. Smith described *malignus* as having the mesonotum transversely striate, so this is evidently a distinct form of at least subspecific value.

It is a beautiful ant, bright ferruginous in color and distinct from other species of Odontomachus in having the vertex bituberculate. The head is constricted behind, but is proportionately smaller and shorter than in other species belonging to the *hastatus* group.

I found the species only once, at Graciosa Bay, where workers were

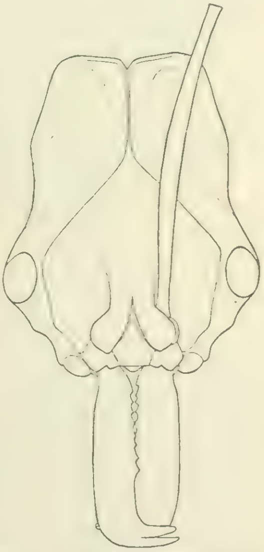


FIG. 13.—Odontomachus malignus tuberculatus Roger. Worker. Front view of head.

moving in and out of the crevices of a large block of coral on the beach. Mr. Harry Hall, who brought me specimens from Simoli on South Malaita, states that he found it there nesting under the same conditions.

MYRMICINAE.

34. SIMA (TETRAPONERA) HUMEROSA Emery.

Ann. Mus. civ. stor. nat. Genova, 1900, **40**, p. 674, ☿.

Ysabel: Fulakora.

35. PHEIDOLE (PHEIDOLACANTHINUS) BELLI, sp. nov.

Worker. Length 2.25 mm.

Head about as long as broad, with convex sides and nearly straight occipital border. Mandibles with ten small teeth. Clypeus convex; anterior border broadly rounded. Antennal scapes surpassing occipital corners by about one fifth their length; first funicular joint longer than the two succeeding joints together; joints two to eight a little longer than broad; club slender, slightly shorter than the remainder of funiculus. Eyes small, convex, situated a little in front of middle of sides of head. Pronotum flattened at middle, armed with a pair of very long and slender spines that extend outward and forward and are rather strongly curved downward at tips. Base of epinotum as long as declivity, flat; epinotal spines as long as those of pronotum, extending outward and backward and rather strongly curved downward at tips. Petiole long and slender; node in profile triangular, gradually sloping into the pedicle; from above, as long as broad, with the sides subconulate. Postpetiole longer than broad, with slightly convex sides. Gaster long and rather narrow. Legs long and slender.

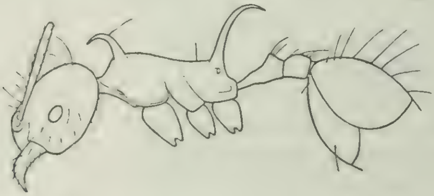


FIG. 14.— Pheidole (Pheidolacanthus) belli Mann. Worker.

Shining throughout, and smooth, except for very fine scattered punctures on head and thorax and delicate rugulae on apical part of mesonotum; base of first gastric segment with very broad and shallow foveolate punctures.

Sparse, long, erect pile scattered on head, body, and appendages.

Black; mandibles, antennae, and legs dark reddish brown. Pilosity dark.

Malaita: near Fourafi, in the interior.

Described from one worker.

This species, which is dedicated to Mr. W. P. Bell, Resident Commissioner of Malaita, resembles *P. flavothoracica* Viehmeyer but differs in having the thoracic and epinotal spines more slender and strongly curved, in the structure of the petiole and in color.

I follow Viehmeyer in considering the above species as belonging to the subgenus Pheidolacanthinus, although it has 12-jointed antennae. From Smith's description and figure of the genotype (*P. armatus*) that form is merely a Pheidole allied to the better known *P. sexspinosa* Mayr. and belonging to a group of species with armed pronota that may be considered of subgeneric rank.[1]

36. Pheidole (Pheidolacanthinus) sexspinosa Mayr.

Verh. KK. zool.-bot. gesellsch. Wien, 1870, **20**, p. 977, ☿ ♃.

Santa Cruz: Graciosa Bay. San Cristoval: Wai-ai, Wainoni Bay. Malaita: Auki. Ysabel: Fulakora.

36a. Pheidole (Pheidolacanthinus) sexspinosa Mayr, var. fuscescens Emery.

Term. fuzet., 1900, **23**, p. 323, ☿ ♃.

Florida: Tulagi.

37. Pheidole (Pheidolacanthinus) erato, sp. nov.

Soldier. Length 3.5 mm.

Head large, nearly twice as broad as pronotum, a little longer than broad, with slightly convex sides, rounded occipital corners, and narrowly and deeply impressed border; transverse impression of vertex strong. Mandibles stout, bluntly dentate apically; outer border a little concave in front of middle. Clypeus flat, its borders poorly defined, carinate, concave at middle of anterior border. Frontal area deeply impressed. Frontal carinae divergent, as long as the scape and bordering a moderately well-defined scrobe. Antennal scapes extending a little more than half the distance to occipital corners. Club slender, funicular joints longer than broad. Eyes small and convex, situated a little in front of anterior third of sides.

---

[1] In response to my request to examine the type of Pheidolacanthinus, Mr. Horace St. J. Donisthorpe writes as follows:—

"Smith's type of *Pheidolacanthinus armatus* is not in the British Museum. As however it is at Oxford, I have got Prof. Poulton to examine it for me and he reports that the antennae are 12-jointed."

Promesonotum convex. Pronotum with a pair of spines pointing upward and outward, about two thirds as long as width of pronotum, thick basally and acuminate at tips. Mesonotum transversely ridged and with two small denticles. Epinotum with a narrow margin between basal and declivous surfaces; both surfaces concave; spines twice as long as their distance apart at base, only slightly divergent and curving a little backward, angulately denticulate at anterior third. Petiolar node with flat anterior and concave and margined posterior surfaces; impressed at upper border, sides elevated and bluntly triangular. Postpetiole a little broader than long; broadest in front, with rather prominent, bluntly angulate anterior corners.

Moderately shining, except gaster, which is subopaque. Mandibles shining, with coarse scattered punctures. Sides of clypeus striate. Head with coarse irregular striae extending as far as tips of scapes, intervening spaces rugulose, vertex, occiput, pronotum, and mesonotum very coarsely rugose-striate. Scrobe granulose. Base of epinotum finely and transversely striate. Postpetiole with broad, longitudinal sulci. First gastric segment very densely striate and punctate throughout; granulose basally; second and third segments densely punctate. Legs smooth and shining.

Scattered, erect, yellow hairs present on head, body, and appendages.

Color brownish red, mandibles red. Legs yellow.

Worker. Length 2 mm.

Head as long as broad, rounded at sides and behind. Mandibles 7-dentate. Clypeus flat, broadly rounded anteriorly. Antennal scapes surpassing occipital corners by more than one fourth their length; funicular joints two to seven about as broad as long. Pronotum flat, pronotal spines slender, as long as their distance apart at base, directed forward and outward and slightly curved downward. Epinotum concave between the spines, which are twice as long as distant apart at base, erect and rather strongly curved backward. Petiole four times as long as broad; node feebly margined in front and sides. Postpetiole longer than broad, broadest behind, with slightly convex sides.

Mandibles shining. Head subopaque, granulosely punctate with a few fine longitudinal striae on front and cheeks. Promesonotum punctate similarly to head, but more shallowly, with striae more abundant and more shining. Epinotum subtly punctate and shining. Petiole, postpetiole, gaster, and legs shining.

Very fine, yellow pile scattered throughout.

Uniformly yellow.

Female (deälated). Length 4.50 mm.

Head about as broad as long; moderately concave behind at middle. Furrow of vertex shallow. Front with a deep pit anterior to median ocellus. Eyes small, situated at sides in front of middle. Pronotum with short, stout, triangular spines. Epinotal spines a little shorter than their distance apart at base, stout. Petiole shorter than in the soldier; node similar to that of soldier but with the lateral angles more rounded. Postpetiole twice as broad as long, broadest in front.

Sculpture of head similar to that of soldier; scrobe coarsely granulose. Mesothorax longitudinally rugosely striate. Scutellum rugose. Epinotum with fine oblique striae. Petiole, postpetiole, and gaster with sculpture similar to that of soldier.

Pilosity as in soldier.

Color dark ferruginous, with the legs paler.

Ysabel: Fulakora.

Described from a single soldier, a female, and two workers.

The almost opaque gaster, with the second and third, as well as the first segment, densely punctate, and the color separate *erato* from *tetracantha* Emery. Judging from Emery's description *tetracantha* has shorter epinotal spines. The two forms are closely related; the difference may be only subspecific. *P. singularis* Smith has the gaster similarly punctate, but has shorter antennal scapes and entirely different frontal carinae, as shown in Emery's figure (Ann. Mus. civ. stor. nat. Genova, 1887, **25**, pl. 1, fig. 13).

38. PHEIDOLE MENDANAI, sp. nov.

Soldier. Length 4.5–5 mm.

Head large, longer than broad, with nearly straight sides and deeply excised border; transversely depressed at vertex; frontal sinus profound to a point a little behind the level of eyes where there is a foveolate pit and more feebly impressed anterior to this, extending to a point opposite the anterior border of eyes and terminating in a small pit. Mandibles stout, very bluntly bidentate at tip. Clypeus triangular, the surface depressed and flat, weakly carinate for entire length, anterior border depressed and concave at middle. Frontal area not distinct. Frontal carinae shorter than the scapes, dilated basally, rather broadly covering the antennal insertions; behind no stronger than the other carinae on front. Antennae short and slender, their scapes extending less than half the distance to occipital corners; club slender, shorter than remainder of funiculus; joints two to eight distinctly longer than broad. Eyes small (about thirty facets), convex, situated at anterior fourth of sides. Pronotum rounded, sides produced posteriorly into short blunt cones, which have the borders distinctly margined. Promesonotal suture feebly impressed. Mesonotum submargined at sides, flat above; behind descending abruptly to the deeply impressed mesoëpinotal suture. Epinotum concave on basal and declivous surfaces, armed with stout, erect spines which are about as long as distant at base. Petiole a little more than twice as long as broad, flattened above, margined at sides; node from above four times as broad as long, submargined behind and somewhat impressed at middle. Postpetiole twice as long as broad, rounded in front and behind, submargined above; sides produced into coarse blunt spines, each about half as long as the width of petiolar node.

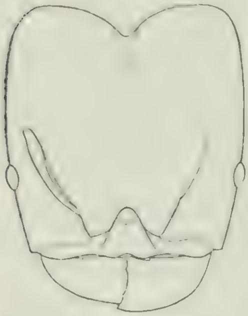


FIG. 15.— Pheidole mendanai Mann. Soldier. Front view of head.

Moderately shining. Mandibles delicately striolate and coarsely, regularly punctate. Clypeus smooth, except for two striae laterally. Front and cheeks longitudinally striate, the striae dense on cheeks and more widely separated on front, with the intervening spaces delicately rugulose. Vertex and occiput reticulately striate and rugulose, the striae strongest on occiput. Thorax and base of epinotum sparsely, delicately, and irregularly striated transversely, Node of petiole and postpetiole rugulose. First gastric segment densely striolate throughout.

Legs shining.

Fine silky erect hairs present on head, body, and appendages, shorter and finer on head.

Ferruginous; gaster lighter. Mandibles and anterior border of head darker, legs pale.

Worker. Length 2.25 mm.

Head a little longer than broad, as broad in front as behind, sides slightly convex, posterior border broadly and shallowly concave. Mandibles elongate, with five fine and two larger, triangular teeth. Clypeus flattened anteriorly and carinate at middle of anterior two thirds; anterior border nearly straight. Antennal scapes surpassing occipital corners of head by a little less than a third of their length; funicular joints longer than broad; club slender, shorter than remainder of funiculus. Eyes convex, situated a little in front of middle of sides of head. Pronotum convex, sides at posterior third producèd into short, margined angles. Mesonotum flat, sloping toward mesoëpinotal suture. Base of epinotum flat, submargined at sides, concave between the spines, which are stout and as long as their distance apart at base; basal portion concave and feebly margined laterally. Petiole nearly four times as long as broad; node about three times as long as broad, rounded at sides. Postpetiole one and a third times as broad as petiole, rounded above and at sides.

Shining. Mandibles coarsely punctate. Cheeks with regular, coarse, separated striae; front with fine striae; vertex and occiput rugulosely punctate and delicately reticulately striate. Thorax, petiole, and postpetiole very finely rugulose. First gastric segment minutely punctate.

Fine erect hairs moderately abundant on head, body, and appendages.

Testaceous to light ferruginous.

Female. Length 6 mm.

Head barely broader than long, narrowed anteriorly, concave at occipital border, with a furrow extending to the median ocellus. Mandibles and clypeus similar to those of soldier. Antennal scapes extending to lateral ocelli. Thorax narrower than the head. Epinotal spines strong, slightly shorter than their distance apart at base. Petiole more narrowed above than in the soldier and more distinctly margined and more strongly depressed at middle. Postpetiole similar to that of soldier.

Head striate on front and cheeks similar to soldier, but the striae of vertex and occiput are less reticulate and the spaces between are not as rugose. Mesothorax strongly longitudinally striate. Scutellum at basal half smooth, except for a pair of foveolate punctures; at apical half irregularly striate and rugulose. Petiole, postpetiole, and first gastric segment sculptured as in worker.

Hairs yellowish, long and moderately abundant.

Ferruginous; wings infuscated.

Ysabel: Fulakora.

Described from specimens taken from a colony found beneath a log.

Type.— M. C. Z. 9,161.

The closely related *P. laminata* Emery from New Guinea differs in having the frontal lamellae produced more angularly in front and in its much smaller size. In *mendanai*, as in *laminata* and *cryptocera* Emery the gaster is microscopically scabrose and subopaque.

39. PHEIDOLE ISIS, sp. nov.

Soldier. 2.75–3 mm.

Head a fourth longer than broad, sides parallel; posterior border deeply concave at middle and vertex very strongly impressed transversely, so that the posterior corners stand out prominently, somewhat lobiform. Mandibles thick, outer border straight at middle, blades edentate. Clypeus flat, concave at anterior border, strongly carinate. Frontal area deeply impressed. Frontal lamellae flat, dilated; frontal carinae strong, expanded laterally, a little longer than the scapes, and bordering a broad scrobe capable of containing the entire scape (similar to *cryptocera* Emery). Antennae short, their scapes extending less than half the distance to occipital corners; funicular joints two to eight strongly transverse; club moderate, shorter than remainder of funiculus. Eyes small (about fifteen facets) and convex, situated at sides of head well in front of middle. Promesonotum without suture, about as broad as long, sides strongly produced conically and ending in stout triangular spines; sides of mesothorax obtusely angulate, posterior portion perpendicular to the mesoëpinotal impression. Epinotum concave between the spines, which are stout, about as long as their distance apart at base and extending upward and backward and slightly curved inwardly. Petiolar node in profile cuneiform; above deeply emarginate with the sides narrowly margined and obtusely angulate. Postpetiole twice as broad as petiole, produced conically at sides. Gaster short and broad. Legs rather slender.

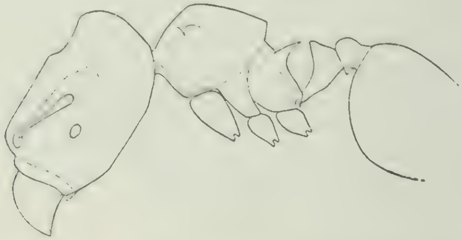


Fig. 16.— Pheidole isis Mann. Soldier. Lateral view of head, thorax, and petiole.

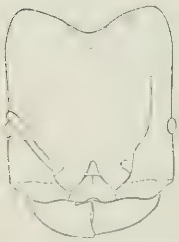


Fig. 17.— Pheidole isis Mann. Soldier. Front view of head.

Opaque. Mandibles punctate, shining. Clypeus shining, finely striate. Front and cheeks subopaque with coarse, very rugose striae and the intermediate spaces rugulose. Scrobes coarsely and granulosely punctate. Vertex rugosely reticulate. Occipital region with rather regular reticulate striae and the enclosed portions smooth and shining. Pronotum coarsely, reticulately striate and rugose. Mesonotum more finely rugose, longitudinally striate at sides. Epinotum with series of fine and short transverse striae. Petiole, postpetiole, first gastric segment, and posterior portions of second and third segments very densely punctate and opaque.

Sparse erect hairs on head, body, and appendages.

Head and mandibles light brownish red; thorax, epinotum, petiole, and postpetiole very dark reddish brown, almost black. First gastric segment brownish yellow, with the posterior border and the remainder of gaster the same color as thorax. Appendages brownish yellow.

Worker. Length 1.40 mm.

Head a little longer than broad, sides slightly convex, posterior border feebly concave at middle. Frontal carinae short. Antennal scapes barely surpassing occipital corners; funicular joints two to eight transverse. Promesonotum rather flat. Pronotal spines extending outward and forward, a little less than half as long as their distance apart at base. Epinotum flat basally; spines extending upward and backward and very slightly curved, nearly twice as long as their distance apart at base. Petiole triangular in profile, upper border notched at middle. Postpetiole one and a third times as broad as petiole, evenly rounded at sides, with straight anterior and posterior borders.

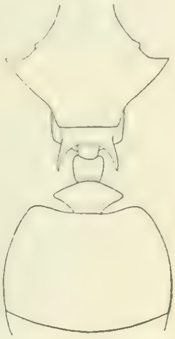


FIG. 18.—Pheidole isis Mann. Soldier. Dorsal view of thorax and petiole.

Opaque. Head, thorax, and abdomen regularly, densely, and granulosely punctate, the gaster more subtly than the rest; head with sparse striae on front and vertex and indistinct reticulate striae on occiput.

Hairs sparse, semirecumbent, with a few erect on head and thorax.

Head light reddish brown. Thorax, petiole, and postpetiole very dark brown. Gaster and legs brownish yellow.

Female (deälated). Length 3 mm.

Head similar to that of soldier, but broader, with less prominent occipital corners and less emarginate behind. Pronotum with bluntly conical spines. Epinotal spines stout, about as long as their distance apart at base. Petiole shorter than in soldier. Postpetiole broadest in front and subconate.

Head with sculpture similar to that of soldier. Mesothorax irregularly striate longitudinally and densely punctate. Scutellum more finely striate and punctate. Petiole, postpetiole, first gastric segment, and posterior portions of remaining segments densely granulosely punctate.

Pilosity as in soldier.

Color brownish red, with the pronotum, scutellum, a large quadrangular blotch on mesonotum, thoracic pleurae, petiole, postpetiole, base and apical border of first gastric segment, and the rest of gaster fuscous. Legs brownish yellow.

Ysabel: Fulakora.

Near *P. tetracantha* Emery but is smaller, the clypeus is carinate at middle, the epinotal spines are shorter and the sculpture and color entirely different.

The carinae on the head are strongly rugose, the frontal carinae especially so, having a distinctly crenulate aspect. The elongate and strongly lobed head and the sculpture are very different from *sexspinosa*, though both species belong to the same group.

39a. PHEIDOLE ISIS Mann, var. TAKI, var. nov.

Soldier. Length 3 mm.

Differing from the preceding form only in color, being uniformly pale ferruginous throughout.

San Cristoval: Wai-ai.

40. PHEIDOLE NINDI, sp. nov.

Soldier. Length 2.50 mm.

Head a little longer than broad, slightly impressed transversely at vertex, sides feebly convex, occipital border narrowly excised. Mandibles bidentate apically. Clypeus nearly flat, slightly concave at middle of anterior border, Antennal scapes extending a little more than half the distance to occipital corners; funicular joints two to eight broader than long, club elongate, as long as the remainder of funiculus, with the terminal joint longer than the two preceding joints together. Eyes small, moderately convex, situated at anterior third of sides of head. Promesonotum convex in profile, sides at middle produced as blunt cones. Base and declivity of epinotum not separated; sides of base with a fine, irregular margin; spines shorter than their distance apart at base, straight, elongate, triangular. Petiole thick, node in profile triangular, narrowly rounded above, margined at sides, dorsal surface seen from the front very shallowly concave. Postpetiole transverse, broader than petiole, broadest in front of middle, with nearly straight sides.

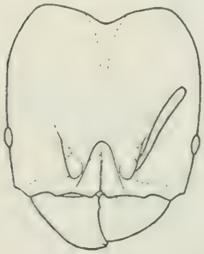


FIG. 19.—Pheidole nindi Mann. Soldier. Front view of head.

Feebly shining. Mandibles with sparse, regular, and coarse punctures. Clypeus with a sharp carina at middle and smaller carinae at sides. Front and cheeks strongly striate longitudinally. Vertex and occiput coarsely reticulate, with the interspaces densely punctate. A flat region on sides of head, inward and posterior to the eyes, cribrately punctate and with a few fine striae. Promesothorax irregularly reticulate striate and punctate. First gastric segment finely and very densely striate longitudinally.

Pubescence moderately abundant, long and fine on body, shorter on appendages.

Brownish red; first gastric segment and appendages yellow-brown.

Worker. Length 1.50 mm.

Head a little longer than broad, as broad in front as behind, sides feebly convex, posterior border shallowly concave at middle. Clypeus with distinct anterior and posterior surfaces which are nearly flat; border straight. Antennal scapes surpassing occipital corners by about twice their width at tip. First funicular joint longer than the following three together; joints two to eight about as long as broad, club slender, as long as remainder of funiculus. Eyes situated at sides of head a little in front of middle. Promesothorax little convex above, gibbous at sides, in profile strongly sloping behind to the mesoëpinotal impression. Base of epinotum longer than the declivity, flat above; spines rather slender, a little shorter than their distance apart at base, extending upward, backward, and slightly outward. Petiole similarly shaped, to that of soldier but thicker and broader above. Postpetiole transverse, twice as broad as petiole, broadest in front of middle.

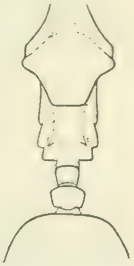


Fig. 20.—Pheidole nindi Mann. Soldier. Thorax and petiole from above.

Nearly opaque. Mandibles finely striate and punctate. Clypeus punctate and finely striate. Head, thorax, and epinotum cribrately punctate, head with fine and sparse striolae, longitudinal on front and cheeks, somewhat reticulate on vertex and occiput. Petiole, postpetiole, and first gastric segment shallowly and rather densely punctate.

Pilosity and color as in soldier.

Female. Length 4.75 mm.

Head broader than long, somewhat narrowed in front, broadly concave behind.

Head strongly, longitudinally striate, reticulate on occiput, and rather densely punctate. Mesothorax with finer, dense, and twisted striae and punctate. Scutellum shining basally with sparse, coarse punctures, rugulose-striate apically. Epinotum shallowly cribrate-punctate. Petiole cribrately punctate, the node transversely striate. Postpetiole strongly and closely striate longitudinally. First gastric segment very densely striolate longitudinally.

Dark brown to black; front of head and anterior third of first gasteric segment brownish red, tips of femora, tibiae, and tarsi yellowish brown.

San Cristoval: Wai-ai (Type-locality), Pamua, Wainoni Bay. Ugi: Pawa.

An abundant species in the above localities, where it nests beneath stones and logs. *Type.*—M. C. Z. 9,169.

41. PHEIDOLE FUSCULA Emery.

Term. fuzet., 1900, **23**, p. 324, ♃ ☿.

Ysabel: Fulakora.

Several colonies were found in rotten logs.

42. PHEIDOLE PHILEMON Forel.

Rev. Suisse zool., 1910, **18**, p. 44, ♃ ☿ ♂.

Santa Cruz: Graciosa Bay. Three Sisters: Malapaina. San Cristoval: Wai-ai. Malaita: Auki.

43. PHEIDOLE UMBONATA Mayr.

Verh. K. K. zool.-bot. gesellsch. Wien, 1870, **20**, p. 977, ♃.

Ugi: Pawa. San Cristoval: Wai-ai. Malaita: Auki.

44. PHEIDOLE OCEANICA Mayr.

Sitzungsb. Akad. wiss. Wien, 1866, **53**, p. 510, ♃ ☿.
Verh. K.K. zool.-bot. gesellsch. Wien, 1870, **20**, p. 979, ♃ ☿.

Ugi: Pawa. Three Sisters: Malapaina. San Cristoval: Wai-ai, Pamua, Wainoni Bay. Malaita: Auki. Ysabel: Fulakora.

This species, which occurs continuously in all the islands from the Tonga group to New Guinea, is also abundant in the Solomons. It lives in large colonies beneath stones or logs or in rotten wood. My specimens agree closely in form and sculpture with a cotype in the U. S. N. M. collection. In the large series before me there is a great deal of variation in color, from dark to light brown.

One soldier from Pamua is interesting in having a large and well-developed median ocellus, situated slightly to the right of the middle of the front.

44a. PHEIDOLE OCEANICA Mayr, var. PATTESONI, var. nov.

Santa Cruz: Graciosa Bay.

All of the soldiers and workers in the series from the above locality are much more uniform and darker in color (dark brown to black) than specimens from the Solomons and may be considered a geographical variety. *Type.*—M. C. Z. 9,162.

45. CARDIOCONDYLA NIVALIS, sp. nov.

Worker. Length 1.75 mm.

Head longer than broad, narrowest in front; sides moderately convex; posterior border very shallowly concave. Clypeus flat above and very broadly and feebly concave at anterior border. Mandibles with three small but distinct teeth and a larger subapical tooth. Antennal scapes extending four fifths the distance to occipital corners; first funicular joint as long as the three following joints together; remaining joints, except those forming the club, transverse; first joint of club as long as broad; second longer than broad, terminal as long as the five preceding joints together. Eyes large and convex, located at sides of head in front of middle. Promesothorax flattened above, the suture very feeble. Sides of prothorax strongly convex; anterior border and humeral angles broadly rounded. Mesothorax about as broad as long, with nearly straight sides. Basal portion of epinotum rounded above; in profile straight, and longer than the concave declivity; spines strong, long, and diverging. Petiole strongly pedunculate, with an acute anteroventral tooth; node from above rounded in front and at sides; in profile deeper than long, with declivous anterior surface, nearly flat top and sloping posterior surface. Postpetiole broader than long; broadest in front of middle, with convex sides and straight anterior and posterior borders; in profile longer than high and convex above. Gaster only slightly longer than petiole and postpetiole together.

Gaster smooth and shining; the rest subopaque and very densely punctulate. Mandibles subopaque and more coarsely punctate.

Anterior border of clypeus with fine long hairs; funiculus and ventral surface of gaster with sparse and fine pubescence, the rest without pile or pubescence.

Gaster jet black; the rest snowy white or faintly tinged with yellowish brown.

San Cristoval: Pamua.

A striking though minute species, very different from any of the species known to me. The color of gaster is in strong contrast to the rest of the body and the long epinotal spines are very distinctive.

Crematogaster subgenus Rhachiocrema, subgen. nov.

In *Crematogaster paradoxa* Emery from New Guinea and the following new species, the enormous development of the epinotal spines and the elongate pedunculate structure of the petiole and the elongate 12-jointed antennae with the 2-jointed funicular club, are so different from other species in the genus that I separate them from Crematogaster *sens. strict.* as a new subgenus.

The type of the subgenus is: —

46. Crematogaster (Rhachiocrema) wheeleri, sp. nov.

Worker. Length 2.50 mm.

Head with moderately convex sides, broadly rounded occipital corners and nearly straight border. Mandibular blades with three stout triangular teeth on apical half. Clypeus convex; anterior border straight. Antennae slender, their scapes surpassing occipital corners; first funicular joint as long as the succeeding two together; joints two to eight distinctly longer than broad; club 2-jointed, slender, terminal joint twice as long as the penultimate. Eyes

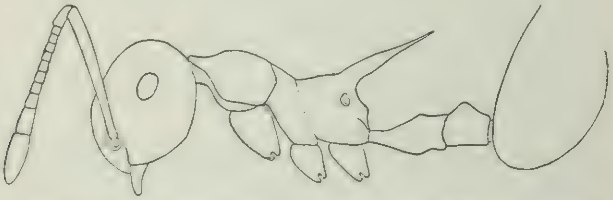


Fig. 21.— Crematogaster (Rhaciocrema) wheeleri Mann. Worker. Lateral view of head, thorax, and petiole.

convex, situated at sides of head, well behind middle. Promesonotum flattened, without suture; humeral angles narrowly rounded. Epinotum bearing two extraordinarily long and massive spines, which are thickened at middle half, acute apically and divergent, the distance between the tips about equal to the length of one spine. Petiole long and depressed, the node longer than broad, broadest behind, with posterior corners elevated and obtusely angulate. Postpetiole broader than long, subangulate at sides.

Shining. Mandibles striate. Clypeus with five or six longitudinal costae. Remaining parts of head and body finely punctate. Pilosity very long and sparse; finer, shorter, and semirecumbent on antennae and legs.

Color black, except mandibles, funiculus, and tarsi which are yellow. The basal half of funiculus is somewhat fuscous and terminal half clear yellow.

Malaita: near Fourafi in the interior.

The few workers on which the description is based were taken running about on stones at the edge of a stream where we stopped for lunch on our walk across the island. *Type.*—M. C. Z. 9,163.

This species is distinct from *paradoxa* Emery in the shape of the spines, which are more thickened, straighter, and less divergent.

47. CREMATOGASTER ELYSII, sp. nov.

Worker. Length 2 mm.

Head subquadrate, about as long as broad; sides convex, occipital angles broadly rounded, posterior border nearly straight. Mandibles short, 4-dentate. Clypeus convex, feebly concave at middle of anterior border. Antennae 11-jointed, scapes not attaining occipital border; funicular joints two to seven moderately transverse, joint eight slightly longer than broad, terminal joint stout, as long as the three preceding joints together. Pronotum bluntly margined at sides; humeri angulate. Mesonotum rather flatter than pronotum and in a different plane, but not separated by impression. Basal portion of epinotum broad and shallowly concave, not distinctly separated from declivity. Epinotal spines half as long as the distance between them

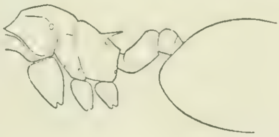


FIG. 22.— Crematogaster elysii Mann. Worker. Lateral view of thorax and petiole.

at base, stout and acuminate, curving upward and backward with the tips inward. Petiolar node a little longer than broad; broadest in front, margined at sides and in front; anterior corners rounded; posterior corners angulate. Postpetiole about as broad as petiole; transverse, longitudinally impressed above. Gaster short. Legs rather stout.

Smooth and shining throughout. Mandibles punctate; cheeks finely striolate. Erect hairs absent, except two to three short and stiff hairs on petiolar node. Head and gaster with very sparse, short, recumbent pubescence. Funiculus and tarsi pubescent.

Color brownish red; gaster jet black.

Three Sisters: Malapaina.

Described from a few workers taken on recently felled trees. *Type.* —M. C. Z. 9,164.

48. Crematogaster abrupta, sp. nov.

Worker. Length 2.50–2.75 mm.

Head slightly longer than broad, as broad in front as behind, with convex sides, broadly round occipital corners; occipital border very feebly concave at middle. Mandibles 4-dentate. Clypeus convex; anterior border very shallowly concave at middle. Antennal scapes not attaining occipital corners; funicular joints two to seven broader than long, joint eight longer than broad; terminal joint as long as the three preceding joints together. Eyes large, little convex, located at sides of head slightly behind middle. Pronotum flattened medially; sides submargined, humeri rounded. Promesonotal impression discernible but very feeble. Mesonotum flat basally, then abruptly declivous, in profile angulate; margined at sides. Epinotum, except for a narrow flat surface at base, concave, without distinct basal and declivous portions; spines half as long as their distance apart at base, strong, acuminate, divergent, curved downward. Petiolar node flat above, longer than broad; anterior corners rounded, posterior obtusely angulate. Postpetiole transverse, longitudinally impressed at middle.

Shining. Mandibles subtly striolate. Head, pronotal disc, concave portion of epinotum, and gaster finely and sparsely punctate; front of pronotum and epinotum, all of mesonotum, petiole, postpetiole, and apical segment of gaster microscopically rugulose.

Without erect hairs above; with rather sparse and fine recumbent pubescence on head and gaster; semierect pubescence on scapes and funiculus.

Color uniformly brownish yellow.

Three Sisters: Malapaina.

This form was much more abundant than the preceding and was found in the same locality. I failed to locate the nests of either. *Type.*—M. C. Z. 9,165.

49. CREMATOGASTER FOXI, sp. nov.

Worker. Length 2.50–2.75 mm.

Head with strongly convex sides, rounded occipital corners and concave border. Mandibles 4-dentate. Anterior border of clypeus straight. Antennal scapes extending four fifths the distance to occipital corners; first funicular joint as long as the three succeeding joints; joints two to eight almost as long as broad; terminal joint shorter than the three preceding joints. Eyes large and moderately convex, situated at sides of head posterior to middle. Thorax slender. Pronotum margined at sides, humeri rounded, disc slightly convex. Mesonotum at sides with a narrow elevated margin, the surface shallow, concave, and, posterior to middle, sloping to the deep mesoëpinotal impression. Epinotum shallowly concave; spines subtriangular, acute, half as long as their distance apart at base and almost straight. Petiolar node slightly longer than broad, narrowed in front, with rounded anterior and angulate posterior corners. Postpetiole a little broader than long, longitudinally impressed above. Gaster elongate.

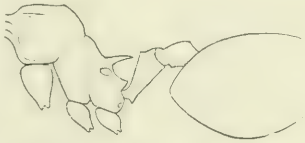


FIG. 23.— Crematogaster foxi Mann. Worker. Lateral view of thorax and petiole.

Shining. Mandibles and cheeks striate. Clypeus with one strong and several very feeble costae at sides. Pronotum with longitudinal costae, two of which extend as borders to the mesothorax. Epinotum with indistinct costae. Petiolar node and base of postpetiole microscopically rugulose, the rest smooth.

Scattered, very long, and erect yellow pile present everywhere, except on legs and antennae where it is fine and semirecumbent.

Color yellow.

Female. Length 6.50 mm.

The striation of the mandibles is much coarser than in the worker. The head and body are smooth and shining, not costate. The wings are hyaline, with fuscous veins and stigma. The color is ferruginous with a spot on vertex and the posterior portions of gastric segments fuscous.

San Cristoval: Pamua, Wainoni Bay.

This species is dedicated to Rev. C. R. Fox, missionary to and student of the natives on San Cristoval. *Type.*— M. C. Z. 9,166.

50. CREMATOGASTER NESIOTIS, sp. nov.

Worker. Length 2.50 mm.

Head with convex sides and shallowly concave occipital border; in the larger workers broader than long. Mandibles 4-dentate. Clypeus convex, very shallowly concave at middle of anterior border. Antennae 11-jointed; scapes not attaining occipital border; funicular joints all longer than broad; club distinctly 3-jointed, terminal joint about as long as the two preceding joints together. Thorax robust; promesonotal suture more fully impressed; pronotum very indefinitely margined at sides, humeri rounded. Mesonotum in profile convex; submargined at sides. Flat basal portion of epinotum rather long, only twice as broad as long; the rest shallowly concave; spines stout and acuminate, little divergent, curved backward and slightly downward. Petiolar node as broad or slightly broader than long, concave above, broadest and narrowly rounded in front of middle. Postpetiole a little broader than long, the medial furrow narrow.

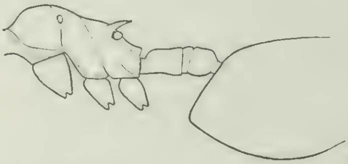


FIG. 24.— Crematogaster nesiotis Mann. Worker. Lateral view of thorax and petiole.

Shining. Mandibles coarsely striate.

Head and gaster with very sparse recumbent pubescence. Pilosity scattered on head and body, erect and moderately abundant; shorter and semierect on legs and antennae.

Color brownish yellow.

Russell: West Bay.

Described from several workers found on tree-trunks. *Type.*— M. C. Z. 9,167.

51. CREMATOGASTER OBNIGRA, sp. nov.

Worker. Length 2.25–3 mm.

Head subquadrate, longer than broad, shallowly convex behind, with rounded occipital corners. Mandibles 4-dentate. Anterior border of clypeus concave. Antennal scapes extending to half the distance between posterior border of eyes and occipital corners; funicular joints two to seven about as broad as long; club slender, terminal joint longer than the two preceding joints. Eyes little convex, situated at sides of head slightly posterior to middle. Thorax robust. Pronotum with rounded sides and humeri. Promesonotal impression indistinct. Mesonotum in profile evenly and rather feebly convex; sides rounded. Base of epinotum massive, convex, distinct from declivity, which is one and one half times as long as base and almost flat; spines stout, triangular, broader at base than long. Petiolar node slightly longer than broad, broadest in front of middle, with narrowly rounded and elevated sides. Postpetiole broader than long, broadly impressed at middle.

Shining. Mandibles coarsely striate. Cheeks, anterior half of pronotum, sides of mesonotum, base of epinotum and meso- and metapleurae striolate. Petiole and postpetiole punctate, the former densely so.

Pilosity moderately abundant, and suberect on head, thorax, abdomen, legs, and antennae.

Color dark brown to black; mandibles and tarsi fuscous.

Russell: West Bay.
Type.— M. C. Z. 9,168.

Key.

Epinotal spines very short; thorax rounded at sides, not margined; base of epinotum separated from declivity by broadly rounded margin; color black . . . . *obnigra* Mann.

Epinotal spines at least half as long as the distance between their bases; thorax, at least in part, margined or submargined; base and declivity of epinotum, not separated . . . . 1.

1. Smaller species (length 2 mm.); humeri angulate; without pilosity; bicolored, gaster jet black, the rest brownish red . . . . *elysii* Mann.

Length 2.25–3 mm. humeri rounded, not bicolored . . . . 2.

2. Petiolar node broadest behind; clypeus bicostate; pronotum and mesonotum sharply costate; gaster unusually long and slender. . *foxi* Mann.

Petiolar node broadest in front; thorax not costate; gaster of ordinary form . . . . 3.

3. Mesothorax with sides margined, in profile angulate behind middle, the posterior face almost perpendicular to the mesoëpinotal impression; body without erect hairs above .... *abrupta* Mann.
Mesonotum not margined, evenly convex in profile; body pilose above. *nesiotis* Mann.

52. VOLLENHOVIA PEDESTRIS (F. Smith).

Myrmica pedestris F. Smith, Journ. proc. Linn. soc. London. Zool., 1862, **6**, p. 46, ☿.

Santa Cruz: Graciosa Bay. Santa Anna. San Cristoval: Wai-ai Pamua, Wainoni Bay. Ugi: Pawa. Malaita: Auki. Ysabel: Fulakora.

This is the most widely distributed species of Vollenhovia and one of the commonest ants in the Solomons. The colonies are found beneath bark and in rotten wood where some humidity is present. They make well-defined runways beneath the bark and move along these, more or less in file. One colony, seen at Ugi, was composed of many thousands of individuals and occupied the entire interior of a hollowed log lying on the ground. In collecting from this nest I was stung repeatedly, but the sting was not severe.

53. VOLLENHOVIA SUBTILIS Emery.

Ann. Mus. civ. stor. nat. Genova, 1887, **25**, p. 454, ☿ ♀.

San Cristoval: Pamua, Wai-ai, Wainoni Bay. Malaita: Auki.

Found nesting beneath bark. My specimens agree with Emery's description of workers of the typical form from Key Island which have the epinotum smooth and shining at middle.

The variety *affinis* Emery described from New Guinea is not represented among my material.

54. VOLLENHOVIA LOBOII, sp. nov.

Worker. Length 1.50 mm.

Head much longer than broad, with subparallel sides and rather narrowly concave occipital border. Mandibles 5-dentate. Antennae short, their scapes extending about two thirds the distance to occipital corners; first funicular joint as long as the three succeeding joints together; joints two to seven strongly transverse; club large, longer than the rest of funiculus. Eyes little convex, situated at sides of head well in front of middle. Promesonotum flattened; humeri bluntly angulate. Mesoëpinotal suture moderately impressed. Basal portion of epinotum flat, longer than the declivity; declivity flat, with blunt, elevated margins laterally. Petiolar node a little longer than broad; in profile slightly longer than high, with sloping anterior and rounded posterior surfaces. Postpetiole subglobose, a little broader than petiole.

Feebly shining throughout. Mandibles sparsely punctate. Head reticulately striate and punctate; clypeus smooth. Promesonotum and epinotum striolate and punctate, more finely and shallowly than the head, with the base of epinotum as strongly so as the rest; thoracic pleurae cribrately punctate; petiole and postpetiole densely but more shallowly punctate. Gaster with fine piligerous punctures.

Fine, long, erect yellowish hairs moderately abundant on head and body; shorter and semirecumbent on appendages.

Dark brown to black; antennae and legs yellowish brown; femora infuscated at basal two thirds.

Malaita: Auki.

Near *brevicornis* Emery but with the scapes a little longer and the sculpture entirely different. The small size, more elongate head and the sculpture of the basal portion of the epinotum distinguish it from *subtilis* Emery and its varieties.

55. VOLLENHOVIA DENTATA, sp. nov.

Worker. Length 1.75–2 mm.

Head about a fourth longer than broad, sides subparallel, occipital corners broadly rounded, border shallowly concave at middle. Mandibles 5-dentate. Clypeus convex, rounded above and at anterior border. Antennal scapes extending three fourths the distance to occipital corners; first funicular joint as long as the three following joints together; joints two to seven moderately transverse; club large. Eyes slightly convex, situated at sides of head a little in front of middle. Promesonotum flattened; humeri obtusely angulate. Mesoëpinotal suture moderately impressed. Basal and declivous surface of epinotum rounding into each other; sides of declivity with margin that is elevated at middle into a small, stout, triangular tooth. Petiolar node a little longer than broad; in profile about as high as long, anterior face declivous, dorsal and posterior surfaces moderately rounded; anteroventral tooth broad and thin, rounded at tip. Postpetiole one and a third times as broad as petiole and a little broader than long; in profile, as long as high, rounded above. Legs less swollen than in the related species.

Feebly shining. Mandibles with sparse, fine punctures. Head, thorax, and base of epinotum rugosely punctate and reticulately striate. Petiole, postpetiole, and first gastric segment with foveolate punctures which are more regular and shallower on the gaster.

Fine, erect, yellowish hairs moderately abundant on head and body, and shorter, stiffer, semierect ones on appendages.

Dark, reddish brown, gaster black; mandibles and appendages yellowish brown.

Male. Length 2.25 mm.

Head, excluding eyes a little longer than broad, corners broadly rounded, occipital border nearly straight. Mandibles elongate, flat and broadly rounded at tips. Clypeus strongly convex, narrowly rounded in front. Eyes large and convex, more than half as long as head; situated at a distance equal to one fifth their length from the anterior borders of head. Ocelli large. Antennae slender, 13-jointed, their scapes two thirds as long as the eyes; first funicular joint scarcely longer than the second; all joints longer than broad, increasing in length toward apex; apical joint slender, about as long as the two preceding joints together. Thorax robust. Mesothorax flat. Mayrian furrows not present; parapsidal furrows short and broad. Scutellum transverse, flattened. Epinotum with a rounded angle between base and declivity. Petiole in profile longer than high, broadly rounded above; beneath with a minute sharp tooth in front of middle; from above, longer than broad, with moderately rounded sides. Postpetiole subglobose, a little broader than petiole. Gaster narrow. Genitalia prominent, legs long and very slender.

Feebly shining. Head subopaque, densely punctate. Thorax, petiole, postpetiole, and first gastric segment finely, shallowly, and rather densely punctate, the gaster less densely than the rest.

Short, silky hairs abundant on head, body, and appendages.

Color dark brown to black; legs brown, antennae yellowish brown. Wings evenly infuscated.

Ugi: Pawa.

This species differs from the other Papuasian forms in the denticulate margins of the epinotal declivity, in the coarse punctation of the first gastric segment, and the generally coarser sculpture of head and thorax. It was fairly common on Ugi, nesting beneath bark like the other species. I did not find it on other islands, but took the following subspecies on Malaita. *Type.*— M. C. Z. 9,170.

55a. VOLLENHOVIA DENTATA Mann, subsp. MARGINATA, subsp. nov.

Worker. Length 2 mm.

Differing from *dentata* in having the teeth at margins of epinotal declivity longer and narrower. The anterior upper border of the petiolar node is distinctly margined. The sculpture of the promesothorax is feebler, especially in the middle where it is reduced to delicate strialation. The petiole and postpetiole are irregularly and finely strialate and the gaster is not punctate.

The whole body is more shining. The color is light brownish red with the appendages honey-yellow.

Malaita: Interior.

Described from a single worker taken at our camp at 2,300 feet elevation on the trail between Atta and Fourafi.

56. VOLLENHOVIA ELYSII, sp. nov.

Worker. Length 1.6 mm.

Near *brevicornis* Emery. Head about one and a fourth times as long as broad, slightly convex at sides and concave at posterior border. Mandibles 5-dentate. Antennae short, their scapes extending a little less than two thirds the distance to occipital corners. Promesothorax slender and flattened; humeri very obtusely angulate. Mesoëpinotal suture but feebly impressed. Epinotal declivity at sides with a coarse margin that is elevated at middle into a broad, low triangle. Petiolar node a little longer than broad; in profile straight in front, rounded above anteriorly and sloping behind; ventral tooth twice as broad as long and only slightly rounded at tip. Postpetiole subglobose, a little broader than petiole.

Moderately shining. Mandibles sparsely punctate. Clypeus with delicate, interrupted striae. Head, thorax, and base of epinotum irregularly strialate and punctate. Petiole indistinctly striate transversely. Postpetiole finely and shallowly punctate. Gaster with sparse piligerous punctures.

Hairs on head and body abundant, long, and fine; on appendages shorter and semirecumbent.

Color reddish brown; dark on head and light on gaster.

Three Sisters: Malapaina.

In its short antennal scapes *elysii* resembles *brevicornis* Emery, but differs in the much smaller size, in having the sculpture of the thorax uniform, and in the elevated angular margins to epinotal declivity.

The sculpture is more delicate than in the other species I have seen. The difference in sculpture among the species of Vollenhovia is easy to see but difficult to describe.

57. VOLLENHOVIA FOVEACEPS, sp. nov.

Worker. Length 1.50 mm.

Head longer than broad, slightly narrowed in front, with feebly convex sides and rather strongly concave posterior border. Mandibles 5-dentate. Clypeus nearly twice as long as broad, with flattened surface. Antennal scapes thickened distally, extending about three fourths the distance to occipital corners; funicular joints, except the first and those forming the club, strongly transverse. Eyes convex, situated well in front of middle of sides of head. Thorax flattened, with prominently angulate humeri. Mesoëpinotal suture feebly discernible from above. Basal and declivous portions of epinotum rounding into each other, the surface of the latter flat. Petiolar node from above a little longer than broad, with straight sides; in profile, thick, about as high as long, highest at anterior margin, broadly rounded above and behind and declivous in front, anteroventrally with a stout tooth which is broad and rounded apically. Postpetiole nearly twice as broad as petiole, a little broader than long and evenly rounded at sides; in profile as high as long and rounded above.

Gaster elongate oval. Legs long, femora and tibiae thick.

Shining throughout. Mandibles impunctate. Head with foveolate punctures which are sparse on occiput and vertex and more abundant in front; front and sides delicately, reticulately striolate, except for a narrow median smooth space extending down front and vertex. Pronotum, mesonotum, sides of epinotum, petiole, and postpetiole with very sparse but strong foveae. The rest smooth, though under a strong lens a subtle reticulation is discernible.

Scattered, sparse, very long, fine, and erect hairs present on head, body, and antennae, and shorter semirecumbent hairs on legs.

Head light brown with a darker blotch on vertex; legs and antennae yellowish, the rest dark brownish red. Pilosity yellowish.

Female (deälated). Length 1.8 mm.

Very similar to the worker, with the usual sexual modifications. The ocelli as large as the cephalic foveae. Pronotum with angulate humeri. Mesonotum flat, transversely oval.

Thorax, epinotum, petiole, and postpetiole with scattered foveolate punctures as in worker, mesonotum with more abundant punctures.

Pilosity more abundant than in worker. Color darker.

Ysabel: Fulakora.

Described from females and workers from two small colonies that contained less than a dozen workers each.

In the very feebly impressed mesoëpinotal suture, the sharply angulate pronotal humeri and in sculpture, *foveaceps* and the closely related *punctata* Vieh. from New Guinea differ markedly from the other Papuasian species. *V. punctata* is larger than *foveaceps* and differently colored and has the petiole and postpetiole similar to *subtilis* Emery subsp. *magna* Viehmeyer. In that form, according to Viehmeyer's description, the postpetiole is somewhat broader than the petiole and has strongly convex sides. In *foveaceps* it is twice as broad as the petiole and the sides are nearly straight.

58. Monomorium talpa Emery.

Lorentz's Nova Guinea, 1911, **9**, p. 252, ☿.

Female. Length 3 mm.

Head rugulosely striate and punctate. Thorax and node coarsely punctate. Epinotum in profile angulate similarly to worker. Petiole and postpetiole thicker than in worker.

Color dark reddish brown; mandibles, antennae, and legs brownish yellow.

San Cristoval: Star Harbor, Wainoni Bay. Ugi: Pawa.

Occurs beneath stones and in rotten logs.

59. Monomorium pharaonis (Linné).

Formica pharaonis Linné, Syst. nat., ed. 10, 1758, **1**, p. 580.

Malaita: Auki. Ugi: Pawa.

60. Solenopsis pawaënsis, sp. nov.

Worker. Length 1 mm.

Head a little longer than broad, broadest behind, with moderately convex sides and concave occipital border. Clypeus bicarinate and bidentate, the teeth broad and triangular. Mandibles with four large teeth. Antennal scapes extending three fourths the distance to occipital corners; funicular joints two to six moderately transverse; club slender, as long as the rest of funiculus, terminal joint nearly four times as long as the penultimate. Eyes minute, composed of only one facet. Promesonotum a little longer than broad, rounded above and at sides. Mesoëpinotal impression profound. Epinotum with equal base and declivity, the former flattened, the latter slightly concave and margined laterally. Petiolar node in profile subtriangular, rounded above; about as long as the pedicel; from above broader than long. Postpetiole slightly broader than petiole, and one and one third times as broad as long.

Shining throughout. Epinotum and pedicel of petiole coarsely and densely, though shallowly, punctate and less shining than the other parts.

Front and clypeus with a few long and coarse hairs. Head and gaster sparsely and microscopically pubescent.

Color yellow to yellow-brown.

Ugi: Pawa (Type-locality). Ysabel: Fulakora.

The Pawa specimens are darker than those from Fulakora but otherwise identical.

Solenopsis pawaënsis resembles *papuana* Emery, but differs in its minute eyes, the narrower petiole and in the coarse punctuation of the epinotum and pedicel.

61. SOLENOPSIS CLEPTIS, sp. nov.

Worker. Length 1 mm.

Head quadrangular, longer than broad, as broad in front as behind, with nearly straight sides, broadly rounded occipital corners and straight border. Mandibles stout, 3-dentate. Clypeus bicarinate, the carinae little divergent, terminating in acuminate teeth. Antennae short, scapes extending less than two thirds the distance to occipital corners; funicular joints two to six twice as broad as long; terminal joint slender, as long as the rest of funiculus. Eyes situated at front fourth of head, as long as the diameter of scape at base. Promesothorax one and a half times as long as broad; pronotum with rounded sides. Basal portion of epinotum convex and rounding into the declivity which is convex and three times as long as the base. Petiolar node in profile with nearly straight anterior surface; the top and posterior surface round into each other; ventral surface strongly bisinuate; peduncle much shorter than the node; node from above subglobose, as broad as long. Postpetiole a little broader than the node and a little broader than long.

Shining, with sparse, shallow punctures, each with a long, erect hair. Legs and antennae with shorter, suberect hairs. Mandibles sparsely punctate.

Color brownish red; appendages lighter and gaster somewhat darker.

San Cristoval: Wai-ai.

Solenopsis dahli Forel and *maxillosa* Emery are similar to *cleptis*, but the latter is distinct in having the antennal scapes much shorter and in the bisinuate ventral surface of the petiole.

62. OLIGOMYRMEX ATOMUS Emery.

Term. fuzet., 1900, **23**, p. 328, pl. 7, fig. 30, ♃.

Female (deälated). Length 2.75 mm.

Form long and slender. Head about a fourth longer than broad, occipital border less concave than in worker and unarmed. Ocelli large. Eyes large and but little convex, situated at sides of head at a distance of less than half their length from anterior margins. Thorax flat above, slender. Epinotum without distinct base and declivity, flattened, unarmed. Petiole and postpetiole as in soldier. Gaster subcylindrical, three times as long as broad.

Sculpture of head as in worker. Thorax and epinotum shining, sparsely though rather coarsely punctate. Petiole and postpetiole rather densely punctate. Gaster finely and regularly punctate.

Color reddish brown; appendages lighter.

Ysabel: Fulakora.

Several colonies of this minute species were found in rotten wood. The soldiers agree closely with Emery's description but the occipital border is rather more deeply concave and the mandibular teeth larger and more regular than shown in Emery's figure. The color is darker and comparison with specimens from New Guinea may show the Solomon Island specimens to be different.

63. OLIGOMYRMEX VIEHMEYERI, sp. nov.

Soldier. Length, 2.50 mm.

Head about a third longer than broad, with subparallel sides and broadly rounded occipital corners; occipital border strongly concave at middle, upper borders of concavity armed with short denticulate processes. Mandibles with four stout teeth and two smaller ones. Basal portion of clypeus flat and separated by an angle from the anterior part which is slightly concave, anterior border broadly rounded. Frontal area large, triangular. Antennal scapes flattened basally, extending less than half the distance to occipital corners; funicular joints three to seven a little broader than long, joints eight and nine about as long as broad; club a little shorter than remainder of funiculus, terminal joint nearly three times as long as penultimate. Eyes oval, twice as long as broad, very flat, situated at anterior third of sides of head. Pronotum elevated, strongly convex above and at sides. Promesonotal suture feebly impressed. Mesonotum slightly convex. Mesoëpinotal suture profoundly impressed. Epinotum concave between the spines, which are triangular and acute apically, about twice as long as their width at base and extending upward and slightly forward. Petiolar node squamiform, emarginate at middle of upper border; from above three times as broad as long. Postpetiole a little broader than petiole, broadest in front and narrowly rounded at sides, gaster elongate oval.

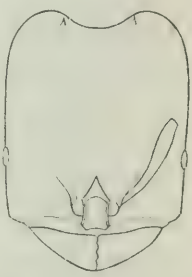


Fig. 25.—Oligomyrmex viehmeyeri Mann. Soldier. Front view of head.

Shining. Mandibles sparsely punctate. Middle of clypeus and frontal area smooth. Sides of clypeus, cheeks, and front longitudinally striate and finely rugulose between the striae; vertex and occiput rugulose, with indistinct striae. Promesonotum rugulose, pleurae, epinotum, and peduncle of petiole cribrately punctate. Petiolar node finely punctate. Postpetiole and base of first gastric segment rugosely punctate, remainder of first gastric segment with regular punctures.

Recumbent silky pubescence moderately abundant on head and body and sparse, coarser, erect pile on front of head, petiole, postpetiole, and apical portion of gaster.

Fuscoferruginous; mandibles and appendages lighter.

Worker. Length .75–1 mm.

Head a little longer than broad, with convex sides and nearly straight occipital border. Mandibles with five rather large triangular teeth. Antennal scapes extending three fourths the distance to occipital corners; middle funicular joints transverse; club as long as remainder of funiculus, terminal joint three times as long as penultimate. Eyes small, situated at sides of head well in front of middle. Promesonotum subglobose, as long as broad. Epinotum flattened at base, the spines slender, acute, a little less than half as long as their distance apart at base. Petiolar node higher than long, twice as broad as long and rounded above. Postpetiole as broad as petiole, transversely oval. Gaster short and broad. Legs long.

Shining. Cheeks striate. Epinotum cribrately punctate, the rest very finely punctate.

Fine short, recumbent pilosity sparsely distributed on head, body, and appendages.

Color light ferruginous; appendages yellowish.

Female. Length 2.80 mm.

Form slender. Head much longer than broad, sides subparallel, posterior border feebly emarginate. Ocelli prominent. Eyes large and rather flat. Thorax two and a half times as long as broad, broadest at wing insertions, flattened above. Petiolar node shorter and thicker than in soldier and not emarginate above. Postpetiole slightly broader than petiole, transversely oval. Gaster three times as long as broad.

Shining. Head punctate similarly to that of soldier. Epinotum rugulose. Petiolar node densely and shallowly punctate, the remainder with sparse, fine punctation.

Pilosity of head as in soldier, of thorax and abdomen more abundant, erect on thorax and suberect on abdomen.

Color fuscoferruginous; appendages lighter. Wings hyaline, veins brown.

Male. Length 2.5 mm.

Head, excluding eyes, much longer than broad, concave at occipital border. Mandibles well developed, 5-dentate. Clypeus flattened at middle. Antennae (broken in specimens before me) with scape twice as long as first funicular joint, joints three to ten cylindrical, each as long as the eye. Eyes very large and convex. Ocelli large. Thorax twice as long as its width at wing insertions. Scutellum slightly convex. Petiole about twice as long as broad, node low and rounded. Postpetiole barely broader than petiole and as broad as long, narrowed in front. Genitalia prominent.

Shining. Head very finely rugosely striolate, thorax and abdomen very minutely punctate; postpetiole rather densely so. Hairs on head and thorax short, stiff, and erect; on gaster silky and recumbent. Funicular joints with a dense covering of short, white hairs.

Ferruginous; head epinotum, petiole, postpetiole, and first gastric segment fuscous.

Wings hyaline, with dense fuscous hairs, veins brown.

San Cristoval: Wai-ai.

Described from a series taken from several colonies in rotten wood. The worker resembles that of *O. subreptor* Emery of New Guinea which is known only from that phase, but has very pronounced epinotal spines, while in *subreptor* the sides are merely obtusely angulate. *Type.*—M. C. Z. 9,171.

64a. PODOMYRMA BASALIS Smith, subsp. SALOMO, subsp. nov.

Worker. Length 5.5–6.5 mm.

In general appearance very similar to the typical Australian form, but differing in the following characters:—

The striae of the head, instead of being strong and uniform, are very delicate, and, on the vertex, almost obsolete, and interspersed with coarse, shallow punctures.

The occipital region is strongly infuscated and the femora are bright ferruginous, except at the apical third, where they are black. The apical band on the first gastric segment is narrow, though with a tendency to extend forward as an obscure median line.

Florida: Tulagi. Malaita: Auki.

64b. Podomyrma basalis Smith, subsp. woodfordi, subsp. nov.

Worker. Length 3.50–4.75 mm.

Head quadrate, a little longer than broad, as broad in front as behind, sides nearly straight, occipital border broadly and shallowly concave. Mandibles with five stout teeth. Clypeus rather flat, anterior border nearly straight. Frontal carinae very feeble posteriorly, little divergent, extending nearly to occipital border. Antennal scapes stout, extending a little more than two thirds the distance to occipital corners; funicular joints two to eight slightly longer than broad; club shorter than remainder of funiculus, with the terminal joint as long as the two preceding joints together. Eyes large, little convex, situated at sides of head posterior to middle. Pronotum depressed in front, humeral angles broader at base than long, triangular, not very acute at tips. Mesonotal region sloping. Basal portion of epinotum slightly convex, broadly rounding into the declivity. Petiole from above about three times as long as broad, subquadrate; in profile convex at middle, armed dorsoanteriorly with a thick conical spine and anteroventrally with a broader, flat spine, rounded at tip. Femora strongly incrassate, tibiae moderately so.

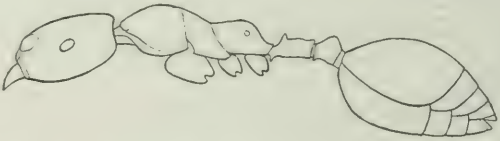


Fig. 26.— Podomyrma basalis woodfordi Mann. Worker.

Moderately shining. Mandibles coarsely striate. Clypeus with three distinct and entire striae on either side and much feebler and shorter striae on middle portion. Striae of head fine, entire, and longitudinal. Pronotum with a series of nine longitudinal, and slightly sinuous costae, six of which extend on to the mesonotum. Epinotum with a low, rounded ridge on either side. Petiole with acute lateral carinae. Basal gastric segment with short striae at middle of base.

Hairs on head, and body and appendages stiff, erect, and sparse, on scapes with very sparse short and fine recumbent hairs.

Color yellow to yellow-brown; the head and thorax darker and the geniculae strongly infuscated.

Female. Length 11 mm.

Head similar to that of worker. Ocelli small. Mesothorax nearly twice as long as broad, truncate behind and narrowly rounded in front; in profile convex at anterior half, flat posteriorly. Scutellum transverse, the surface flattened. Base of epinotum strongly convex; declivity flat. Petiole lacking the anterodorsal projection; in profile two and a half times as long as broad, highest a little in front of middle, with the anterior surface broadly rounding into the dorsum. Postpetiole differing from that of the worker in being broadly instead of narrowly rounded above in profile, with the anterior and posterior surfaces less flat, and in lacking the median impression on the posterior surface. Gaster elongate.

Very shining. Head and mandibles sculptured similar to but more coarsely than that of worker. Prothorax superficially and longitudinally costate. Mesothorax smooth, except apically, where there are a few shallow striae in the middle. Epinotal base costate at sides, declivity smooth. Sides of petiole and posterior portion of postpetiole feebly costate, the rest smooth. Gaster and legs as in worker.

Head with fuscous blotches at ocelli. The fuscous marking of the first gastric segment extends at middle for half the length of the segment. Color otherwise as in worker.

Wings (length 8 mm.) almost clear; veins and stigma pale brown.

Three Sisters: Malapaina.

Described from many workers and two females. *Type.*— M. C. Z. 9,172.

This form is distinct from *basalis* in size, sculpture and color, it was very abundant on Malapaina, and probably occurs elsewhere in the group, but was found only in the tops of recently felled trees.

The colonies live in twigs about an inch in diameter, in chambers evidently made by wood-boring beetles and the same colony may occupy more than one of these chambers, which have no passages between.

65. MYRMECINA MODESTA, sp. nov.

Worker. Length 2.50–2.75 mm.

Head a little longer than broad, with slightly convex sides and shallowly concave occipital border. Clypeus broadly and transversely carinate at middle; bidentate at anterior border. Mandibles stout, their blades armed with six or seven small teeth and a large subapical tooth about as long as the terminal one. Antennal scapes extending to the occipital corners; first joint of funiculus three times as long as the very short second joint; joints three to eight transverse, but not strongly so; club as long as the rest of the funiculus, the terminal joint longer than the two others together. Prothorax three times as broad as epinotum; humeral and inferior corners angulate. Epinotal base sloping and separated from declivity by a transverse border; declivity convex; spines stout at base and acuminate at apex, as long as the declivity. Node, from above, quadrangular, anterior corners angulate; in profile longer than high, with a sloping anterior face equal in length to the straight dorsal surface. Postpetiole broader than long and quadrangular.

Somewhat shining. Head with coarse striae, which are straight and parallel in front and somewhat irregular and oblique at sides. Clypeus and mandibles finely punctate and shining. Striae of thorax strong, longitudinal, and extending to epinotum where they become more feeble apically. Epinotal declivity smooth and shining. Petiole and postpetiole with widely separated costae, the spaces between smooth and shining. Legs sparsely punctate and shining. Gaster finely punctate and more shining than the other parts.

Head, body, mandibles, and legs with very abundantly and finely pilose.

Black. Mandibles, antennae, and legs brownish red, in some specimens the lower part of femora darker than the rest. Pilosity gray.

Male. Length 2.75 mm.

Head, excluding eyes, as broad as long, and broadly rounded behind. Cheeks very short. Clypeus transverse, with truncate anterior border. Antennal scape as long as the first two funicular joints together; first funicular joint a little more than half as long as second; second joint twice as long as broad and a little longer than the third; joints three to eleven subequal, each a little less than twice as long as broad; terminal joint longer than the two preceding joints together. Prothorax convex in front, flattened behind, with strong Mayrian furrows. Scutellum transverse and moderately convex. Epinotum with equal base and declivity, which are separated by an acute margin; spines stout and triangular. Petiole longer than in the worker, and the anterior surface proportionally shorter.

Shining. Head smooth except for a few fine striae inward from the eyes and between the ocelli, and minute punctures. Pro- and mesothorax very finely punctate and with sparse and coarse punctures apically. Scutellum almost smooth on disc, rugose laterally. Base of epinotum with six or seven strong longitudinal striae. Petiole and postpetiole sculptured as in worker. Gaster very shining.

Head, body, and appendages with abundant, long, fuscous pile.

Black; mandibles, antennae, and legs rufous, femora darker; genitalia white. Wings pilose, slightly infuscated, witb brown veins and stigma.

Santa Cruz: Graciosa Bay (Type-locality). Three Sisters: Malapaina. Ugi: Pawa. San Cristoval: Wainoni Bay, Wai-ai. Ysabel: Fulakora.

Occurs in small colonies beneath stones. *M. mandibularis* Viehmeyer from New Guinea is very close to *modesta*, but has on the inner edge of the mandibles a broad widening, which Viehmeyer compares with that of *Acropyga butelli* Forel. In *modesta* the posterior corners of the blades are produced and rounded continuously with the inner border, resembling the structure of the mandible of *Acropyga termitobia*, rather than of *butelli*, as figured by Forel. *Type.*—M. C. Z. 9,186.

65a. Myrmecina modesta Mann, subsp. subarmata, subsp. nov.

Worker. Length 2.50–2.75 mm.

Differing from the preceding in having the epinotal spines much reduced in size, being less than half as long as the epinotal declivity, triangular in shape and not acute at apex.

Malaita: Auki.
Type.—M. C. Z. 9,187.

Key to the Papuasian Species.

Body without strong sculpture; epinotal spines long and acute. (New Guinea)........ *polita* Emery.
At least the thorax coarsely sculptured........ 1.
1\. Gaster opaque, subtly rugosely striate longitudinally. Length 3.5 mm. (New Guinea)........ *opaciventris* Emery.
Gaster shining. Length 2–3 mm........ 2.
2\. Antennal scapes not attaining occipital corners; anterior border of clypeus unarmed. (New Guinea)........ *brevicornis* Emery.
Antennal scapes attaining or surpassing occipital corners; clypeus dentate........ 3.
3\. Pronotum arcuately transversely striate; clypeus obscurely 4–dentate (New Guinea)........ *transversa* Emery.
Pronotum longitudinally striate or punctate........ 4.
4\. Ferruginous; head and promesonotum with piligerous punctures; clypeus 3-dentate. (New Guinea)........ *punctata* Emery.
Black; head and promesonotum coarsely striate; clypeus 2-dentate... 5.

5. Inner edge of mandibles with a broad, blunt thickening. (New Guinea).
mandibularis Viehmeyer.

Inner edge of mandibles swollen apically, but the swollen part continuous with the blade . . . . 6.

6. Epinotal spines as long as the declivity and acute (Santa Cruz).
modesta Mann.

Epinotal spines very short and not acute. (Solomons).
modesta subsp. *subarmata* Mann.

66. PRISTOMYRMEX PEGASUS, sp. nov.

Worker. Length 1.75 mm.

Head, including mandibles, a little longer than broad, with slightly convex sides, broadly rounded corners and nearly straight occipital border. Mandibles strongly curved, their basal borders bluntly dentate anterior to middle, blades acutely 4-dentate. Clypeus concave; with a very short carina basally; anterior border bearing a tooth at each side and feebly bisinuate but not toothed at middle. Antennal scrobes strong, extending two thirds the distance to occipital corners. Antennal scapes not attaining occipital corners; funicular joints two to seven a little broader than long; terminal joint slender, a little longer than the two preceding taken together. Promesonotum robust, broadly and transversely impressed in front, longitudinally impressed behind, both impressions very shallow; sides of mesonotum elevated behind into thin triangular teeth. Epinotum with equal base and declivity, the former transversely carinate apically; spines strong, as long as declivity. Petiolar node in profile higher than long, narrowly rounded above, anterior surface concave, posterior convex; peduncle short, from above nearly twice as long as broad. Postpetiole rounded, in profile higher than long.

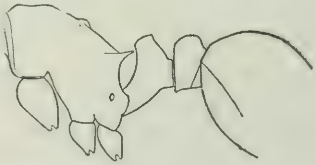


FIG. 27.— Pristomyrmex pegasus Mann. Worker. Lateral view of thorax and petiole.

Shining. Mandibles coarsely, sparsely punctate. Head and thorax foveolately punctate, the punctures being coarser and more abundant on the head; clypeus subopaque, densely punctulate; scrobes transversely carinate in front, smooth behind. Rest of body minutely punctate and very shining. Everywhere with sparse, scattered, rather stiff, suberect hairs. Pile yellowish.

Santa Cruz: Graciosa Bay.

Only one worker was found. The elevated sides of the mesothorax and the absence of the median tooth on anterior border of clypeus is characteristic of this distinct species.

67. PRISTOMYRMEX OBESUS, sp. nov.

Worker. Length 2 mm.

Head as broad as long, with convex sides, broadly rounded corners and straight occipital border. Clypeus flat in middle; anterior border with three triangular teeth. Mandibles stout, their basal border dentate at middle; blades strongly 3-dentate. Eyes little convex, located at middle of sides of head. Antennal scrobes broad and shallow, extending half the distance from eyes to occipital corners. Antennae short; scapes somewhat thickened in front of middle and at apex, extending five sixths the distance to occipital corners; first funicular joint much broader and nearly twice as long as the second; joints two to seven moderately transverse; eight and nine a little longer than broad; terminal joint two and one half times as long as broad, broadest in middle and acuminate anteriorly. Promesonotum with a transverse impression in front which is joined at middle by a deeper longitudinal impression; anterior border thinly margined, sides more roundly margined and bluntly bituberculate; inferior corners evenly rounded. Epinotum with subequal base and declivity, the base transversely carinate at middle; declivity concave, margined at sides; spines triangular, acute and nearly as long as declivity. Peduncle of petiole nearly as long as the node; node in profile deeper than long and highest in front, with concave anterior and posterior surfaces and slightly convex dorsum; from above, twice as long as broad, sides straight. Postpetiole from above, as broad as long; in profile, deeper than long and rounded above.

Shining. Mandibles with sparse and moderately strong punctures. Head, except clypeus and antennal scrobes which are smooth and shining, coarsely, foveolately punctate. Thorax punctate similarly to head but much more sparsely. Epinotum, petiole, postpetiole, and gaster very shining, with a few shallow punctures.

Legs and antennae finely punctate. Every where with scattered, fine, erect hairs.

Color ferruginous.

Female (deälated). Length 2.5 mm.

Differing from the worker in having the epinotal spines shorter, the petiolar node thicker and less elevated. The mesothoracic punctures are coarser.

Male. Length 2 mm.

Head, excluding eyes, as long as broad, broadly rounded behind. Clypeus slightly convex, narrowly rounded in front. Mandibles very feeble. Eyes less than half as long as head, strongly convex, situated at sides at a distance of two thirds their length from base of clypeus. Antennae stout; scape shorter than eyes; first funicular joint half as long as second; joints two to ten subequal, cylindrical, about twice as long as broad; terminal joint as long as the two preceding joints. Mesonotum with strong Mayrian furrows; longitudinally impressed at middle. Scutellum broader than long, slightly convex. Epinotum with distinct base and declivity; tuberculate at sides. Petiole from above more than twice as long as broad; in profile, slender, twice as long as high, the node evenly rounded and grading into the peduncle. Postpetiole rounded, as long as deep and a little longer than broad. Legs slender.

Shining, finely punctate, with rather stiff black hairs scattered on head and body, legs, and scape; funiculus and legs with fine white pubescence.

Color black. Wings strongly infuscated and hairy, veins, stigma, and hairs fuscous.

Ysabel: Fulakora (Type-locality). Malaita: Auki. Three Sisters: Malapaina.

The only colony that I found, beneath a stone at Fulakora, was a small one, composed of less than a dozen workers, a deälated female, and one male.— *Type.*—M. C. Z. 9,173.

In this small series there is some slight variation in the length of the epinotal spines.

Pristomyrmex obesus differs from *quadridens* Emery and *coggii* Emery in not having teeth on the sides of pronotum. The epinotal spines are shorter and thicker in typical *obesus*, but in the following subspecies they are more similar to those of *quadridens*.

67a. PRISTOMYRMEX OBESUS Mann, subsp. MELANOTICUS, subsp. nov.

Worker. Length, 2 mm.

Differ from the typical form in the structure of the epinotal spines, which are much more slender and rather strongly curved upwards, similar to Emery's figure of *quadridens* (Term. fuzet., 1897, **20**, pl. 15, fig. 25). The color is dark fuscous to piceous instead of ferruginous.

San Cristoval: Pamua (Type-locality). Wai-ai.

Found beneath a stone.

Two workers in the series are abnormal. Each bears on one side of the pronotum a single elevated tooth similar to those on *quadridens*. The specimens might be considered as abortive atavistic approaches to some ancestral form very close to *quadridens*. On account of the presence of these spines in a species where they are normally absent I consider this character of too little importance to be used in separating certain of the species into the subgenus Odontomyrmex. *Type.* —M. C. Z. 9,174.

68. PRISTOMYRMEX MENDANAI, sp. nov.

Worker. Length 2.25 mm.

Near *P. lucidus* Emery. Head as broad as long, with slightly rounded sides, broadly rounded occipital corners and subtruncate posterior border. Clypeus flat, carinate at base; anterior border tridentate, the lateral teeth acute, the median one obtuse. Frontal carinae acute; antennal scrobe broad and shallow. Base of mandibles with large obtuse tooth, blades quadridentate. Antennal scapes slightly surpassing occipital corners; funicular joints, except the first and those forming the club, somewhat broader than long. Eyes small and slightly convex, situated at sides of head a little in front of middle. Promesothorax convex in profile, without pronotal spines and with obtusely angulate inferior corners; with a broad median impression extending along the dorsum to declivity of epinotum. Epinotal spines broad at base and acuminate and curved apically. Epinotal declivity concave and broadly margined at sides. Petiolar node as long as peduncle, higher than long; highest in front; convex above; concave on posterior surface; from above, longer than broad and narrowed anteriorly, truncate behind. Postpetiole broader than petiole and slightly broader than long, with straight borders in front and behind and slightly convex sides. The anteroventral margin acutely angulate in profile.

Very shining. Mandibles finely punctate. Head and thorax with scattered and shallow punctures, the spaces between smooth. Petiole, postpetiole, and gaster sparsely and finely punctate.

Everywhere with moderately abundant fine and long pile.

Uniformly brownish red.

Santa Cruz: Graciosa Bay.

Two workers found beneath stones. This species resembles *lucidus* Emery, but is smaller and differently colored, the promesonotal dorsum is strongly impressed and the middle tooth on the border of clypeus is not acute. The closely related *P. levigatus* Emery has the sides of prothorax denticulate in front.

69a. Rogeria stigmatica Emery.

Term. fuzet., 1897, **20**, p. 589, ☿.

Worker. Length 2.25–2.50 mm.
Female (deälated). Length 2.75 mm.

Differing from the worker in the following characters: — the epinotal spines are longer. The mesonotum and scutellum are strongly striated longitudinally. The striae on base of epinotum are stronger. The petiolar node in profile is narrower and the peduncle a little longer.

Male. Length 1.75 mm.

Head, excluding the mandibles, a little broader than long, broadest behind, with rounded corners and straight occipital border. Clypeus convex, anterior border rounded. Mandibles large, their blades dentate. Antennae 14-jointed, slender, thickened distally; scape thickened in front of middle, extending two thirds the distance to occipital corners; funicular joints longer than broad; terminal joint four times as long as broad and equal in length to the two preceding joints together. Eyes convex, located at about one fourth their length from base of mandibles. Ocelli rather flat, situated in large foveae. Mesonotum with strong Mayrian furrows; elevated in front. Scutellum broader than long, convex. Epinotum long, with subequal base and declivity. Petiolar node low, the anterior surface shorter and more convex than the posterior; peduncle as long as node, flattened above, sides margined. Postpetiole longer than high, with a flattened anterior dorsal surface and short convex posterior surface above, broader than long, broadest in front, with obtusely angulate anterior corners. First gastric segment somewhat compressed dorsoventrally. Legs long, not very slender. Wings with long and narrow stigma and a single large cubital cell.

Somewhat shining. Mandibles and clypeus finely punctate. Front of head rugosely punctate, posterior portion of head and pronotum finely punctate. Mesothorax and scutellum rugosely striolate; epinotum finely and densely punctate. Petiole, postpetiole, gaster, and legs finely punctulate and shining.

Fine, long, and semirecumbent pale hairs throughout, but most abundant on head, thorax, and gaster.

Color yellowish brown; pronotum, thoracic pleurae, petiole, and postpetiole lighter. Legs, clypeus, and antennae yellow. Wings hyaline, veins pale, with dense pale hairs.

Ysabel: Fulakora. Ugi: Pawa.

Occurs in small colonies beneath stones in damp localities. This species has a curious exudating habit. When the nest is disturbed the workers twist the gaster to one side and emit from the anal opening a cylindrical white mass of viscid matter, often up to ten millimeters in length, that resembles a small worm. While being emitted, this curls and twists in a life-like manner so that the first time it was observed and before I had located the motionless ant, I mistook it for a cluster of very small worms. This same habit is common also to an undetermined Fijian species, probably of the same genus. *Type.*—M. C. Z. 9,175.

70. ROGERIA EPINOTALIS, sp. nov.

Worker. Length 2–2.25 mm.

Head longer than broad, broadest behind, with rounded corners and straight occipital border. Mandibular blades with five small teeth. Clypeus convex, rounded anteriorly. Antennal scape extending two thirds the distance to occipital corners, first funicular joint a little longer than the two succeeding joints taken together, joints two to six strongly transverse, seven to nine less strongly so, terminal joint equal in length to the three preceding joints. Eyes little convex, situated at sides of head at a distance equal to their longitudinal diameter from bases of mandibles. Promesothorax robust, evenly convex above and at sides. Humeral angles obtuse. Epinotum broadly and strongly concave; base very distinctly margined in front and at sides; declivity indistinctly separate from base and more strongly concave; spines a little longer than their width at base, acuminate, divergent. Petiolar node in profile deeper than long, not narrowed above, with convex dorsum and slightly convex anterior and posterior surfaces; from above, twice as broad as long; peduncle nearly as long as the node. Postpetiole in profile longer than high; anterior surface short and flat, dorsal and posterior surfaces convex; from above, one and one third times as broad as long, broadest in front of middle, with narrowly rounded sides. Legs rather stout.

Shining. Mandibles sparsely punctate. Head rugose and carinate. The carinae between antennal scrobes subparallel, on vertex more irregular and becoming somewhat reticulate. Those in scrobes more widely separated and oblique. Promesonotum with coarse punctures, which are widely separated in front, very sparse on disc and coarser, becoming confluent posteriorly. Pleurae coarsely punctate, except the metapleurae which are smooth and very shining below, with a margin of coarse punctures above. Base and declivity of epinotum smooth and very shining except for a delicate transverse carinula between the two surfaces,. Anterior face of petiolar node and peduncle smooth and very shining; rest of petiole and the postpetiole coarsely punctate. Gaster, legs, and antennae minutely punctulate and shining.

Head and body, excepting epinotum (which is glabrous), anterior surface of petiolar node and the peduncle with long silky, flexuous hairs, which are semirecumbent on posterior portions of gaster and erect elsewhere. Antennae and legs with shorter hairs.

Color ferruginous; legs, antennae, and mandibles testaceous. Pilosity white.

Female. Length 2.25 mm.

Ocelli small. Similar to worker. The petiolar node is thicker and the epinotal spines stronger. Wings hyaline. Veins and stigma brown.

Ysabel: Fulakora (Type-locality). Ugi: Pawa. San Cristoval: Star Harbor. Malaita: Auki.

Described from a few specimens found in very small colonies beneath stones. The concave and impunctate epinotum, the stronger spines, the irregular punctation of the pro- and mesothorax, the smaller size and different coloration distinguish it from the preceding species. *Type.*—M. C. Z. 9,176.

71. TETRAMORIUM SALOMO, sp. nov.

Worker. Length 2.50 mm.

Head a little broader than long, sides in front of eyes somewhat convergent, occipital border shallowly concave. Mandibles 6-dentate, the two anterior teeth larger than the others. Clypeus subcarinate at middle, straight at anterior border. Frontal carinae delicate though distinct, scrobes poorly defined. Antennal scapes slightly surpassing occipital corners; funicular joints three to seven distinctly transverse, the others as long or longer than broad. Thorax evenly convex in profile, not impressed, humeri narrowly rounded. Epinotal spines very slender and acute, a little longer than their distance apart at tips, nearly straight, extending backward and slightly upward. Inferior epinotal angles produced as flat, triangular spines, rather obtuse at tips and a little more than one third as long as dorsal spines. Petiolar node from above oval, narrowed in front, from the side longer than broad evenly convex above, in front evenly rounding into the slender peduncle; anteroventral spine elongate, rounded at tip. Postpetiole broader than petiole and a little broader than long. Legs rather slender.

Gaster very shining, legs moderately shining, the rest subopaque. Mandibles finely punctate, anterior border with short striae. Clypeus with uneven surface and fine longitudinal striae. Head with a series of serrated, slightly tortuous striae which have a tendency to become reticulate on occiput, the interspaces foveolately punctate and rugulose. Thorax and peticle coarsely reticulately rugose and punctate between the rugae. Postpetiole more finely sculptured. Gaster smooth.

Pilosity long and abundant, erect on head and body, suberect on appendages.

Color brownish yellow with the tip of gaster infuscated.

Malaita: Auki.

Described from one worker.

This species resembles *melleum* Emery from New Guinea in general structure and in the long and slender epinotal spines, but the latter species has the petiole in profile much more narrowed above, the postpetiole distinctly broader than long and broader than the petiole; in *salomo* the postpetiole is not broader than long and the sculpture of the body is very different.

72. TETRAMORIUM MELANOGYNA, sp. nov.

Worker. Length 2.5 mm.

Head longer than broad, about as broad in front as behind, with very feebly convex sides and shallowly concave occipital border. Mandibles with three strong teeth on apical half and three weak ones laterally. Clypeus evenly convex, anterior border straight. Frontal carinae rather strong, little divergent, extending nearly to occipital margins and bordering distinct, though shallow scrobes. Antennal scapes extending about four fifths the distance to occipital corners; first funicular joint as long as the three following joints together, joints two to eight transverse; terminal joint a little longer than the two preceding joints together. Eyes situated at middle of sides of head. Thorax, seen from above, with subangulate humeri, constricted between meso- and epinotum; in profile, with shallow mesoëpinotal impression. Epinotal spines nearly straight, longer than their distance apart at base, directed upward and backward; episternal spines thick basally, with the apical half narrow and the tips acute. Petiole with a distinct peduncle, a little longer than the node; the node in profile as high as long and highest at posterior margin, with sloping

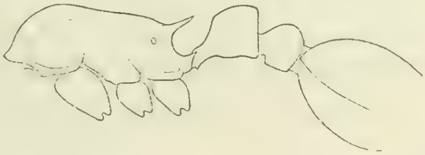


FIG. 28.— Tetramorium melanogyna Mann. Worker. Lateral view of thorax and petiole.

anterior face and moderately convex dorsal surface, seen from above it is elongate oval and somewhat narrowed in front. Postpetiole subglobular, slightly broader than long and distinctly broader than the petiole. Femora rather strongly thickened.

Shining throughout. Mandibles finely striate. Disc of clypeus with three longitudinal rugae, which continue up the front parallel to an outer pair of frontal rugae and become retulate on vertex and occiput, with the spaces between finely and shallowly punctate. Cheeks and sides of occiput reticulately rugulose, antennal foveae bordered with a ridge that is distinctly angulate at middle of sides of the pro- and the mesonotum. Petiole and postpetiole more finely reticulate, with the sides of the former and especially of the peduncle strongly margined. Gaster with short, parallel striae at base.

Color light brownish yellow with the gaster infuscated.

Female. Length 2.80 mm.

Epinotal spines shorter and stouter than in the worker; episternal spines more slender.

Sculpture of head as in worker. Mesonotum and scutellum with longitudinal, somewhat irregular, punctate rugae between. The rest similar to worker.

Color dark brown to black. Wings clear, with pale veins and stigma.

Ugi: Pawa (Type-locality). Three Sisters: Malapaina.

The one colony that I found was in a hollow twig, and contained two of the curiously dark-colored females.

This species closely resembles *pacificum* Mayr, but has the petiole less compressed in front. The coloration, yellow-brown, with infuscated gaster, is different.

73. TETRAMORIUM GUINEENSE (Fabricius).

Formica guineense Fabr., Entom. syst., 1793, **2**, p. 357, ☿.

Malaita: Auki.

The finding of only one colony of this species indicates that it is not especially abundant in the islands, though no doubt it will eventually become widespread in the plantation districts.

74a. TETRAMORIUM SCROBIFERUM Emery, var. ELYSII, var. nov.

Worker. Length 2.75–3 mm.

Head longer than broad, broadest behind eyes; sides in front of eyes nearly straight, occipital corners rounded, border shallowly concave. Mandibles with five short, subequal teeth. Clypeus moderately convex, bluntly carinate at middle; anterior border almost straight at middle. Antennal scrobes well defined, extending beyond eyes, the carinae bordering the inner sides somewhat crenulate and narrow but conspicuously stronger than the carinae of front and vertex. Antennae short and thick; scapes extending less than three fourths the distance to occipital corners; funicular joints two to eight twice as broad as long; terminal joint about as long as the two preceding joints. Eyes not very convex, located in front of sides of head a little behind the middle. Thorax robust, the sides nearly straight; all sutures obsolete; prothorax margined at sides, with angulate humeri. Epinotum with base and declivity rounding into each other, the latter flat: spines acute, curving downward, moderately divergent, a little shorter than their distance at base. Petiolar node higher than long, with short pedicel which is angulate at anterior corners. From above globose, as long as broad. Postpetiole broader than petiole and broader than long.

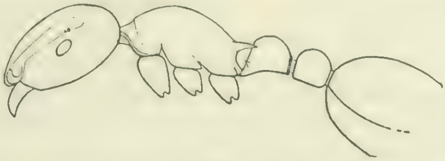


FIG. 29.— Tetramorium scrobiferum elysii Mann. Worker. Lateral view of head, thorax, and petiole.

Subopaque. Mandibles punctate and striate, the striae stronger basally. Clypeus with two carinae lateral to the median one. Antennal scrobes opaque and very densely punctate; head finely and reticulately carinate, the interspaces punctate and feebly shining. Thorax and epinotum densely punctate. Petiole and postpetiole rugulose and more shining. First gastric segment uniformly, shallowly, and very densely punctate and opaque; terminal segments punctulate and rather more shining. Antennae punctate. Legs shining.

Pilosity erect, sparse and white in color.

Color ferruginous. Legs lighter.

Three Sisters: Malapaina (Type-locality). Santa Anna.

The workers on which the description is based agree closely with Emery's description of the typical form from Berlinhafen, New Guinea, except in the lighter color. The epinotal spines in my specimens are proportionately longer than shown in the drawing of *scrobiferum* (Term. fuzet., 1897, **20**, pl. 15, fig. 31). *Type.*—M. C. Z. 9,177.

As Emery has pointed out, this curious species approaches Calyptomyrmex in the structure of the antennal scrobes, the shortly pedunculate petiole, and the short and thick antennae.

75. TETRAMORIUM TONGANUM Mayr.

Verh. K. K. zool.-bot. gesellsch. Wien., 1870, **20**, p. 972, 976, ☿.

San Cristoval: Wainoni Bay. Guadalacanar: Aula.

76a. XIPHOMYRMEX COSTATUS Emery, subsp. FLAVESCENS Emery.

Term. fuzet., 1897, **20**, p. 588, ☿.

Male. Length 3 mm.

Head, excluding eyes, longer than broad; occipital border straight, the angles broadly rounded. Mandibles similar to those of worker, with strong apical and subapical teeth. Clypeus convex, carinate at middle, broadly rounded in front. Eyes very large and convex, located at a distance equal to one fifth their length from bases of mandibles; ocelli large. Antennae slender, 10-jointed, their scapes surpassing occipital corners; first funicular joint one and one half times as long as broad, second joint longer than the third and fourth together, joints three to eight subequal, cylindrical; terminal joint one and one half times as long as penultimate. Mesonotum rather flat at apical half, without Mayrian furrows. Scutellum transverse, little convex above. Epinotum deeply transversely grooved at base; the rest flat, narrowly margined at sides. Petiole long and slender; petiole as long as node, flattened above and narrowly margined at sides; node longer than high; from above longer than broad, transversely impressed apically Postpetiole rounded, broader than long. Legs long and slender.

Shining, petiole, postpetiole, and gaster more so than the rest. Mandibles finely strigose. Clypeus with two lateral carinae which are much stronger than the median one. Head, thorax, and epinotum with reticulate carinae. Petiole, postpetiole, and gaster smooth. Legs finely and rather densely, though shallowly punctate. Antennal scapes finely, funiculus rugosely punctate.

With sparse, scattered, semicircumbent hairs throughout. Color testaceous; funiculus, tibiae, and tarsi fuscous. Wings hyaline; veins and stigma fuscous.

Bio. Three Sisters: Malapaina. San Cristoval: Pamua. Malaita: Auki, Interior of. Florida: Tulagi. Russell: West Bay. Ysabel: Fulakora.

The form that I refer to this subspecies is common in the forests, where workers are frequently seen on tree-trunks and leaves. The colonies are small and live in hollow twigs (in most instances rotten ones), beneath bark and more rarely in the ground.

77. Xiphomyrmex bismarcki Forel.

Mitt. Mus. zool. Berlin, 1901, **2**, heft 1, p. 17, ☿.

New Georgia: Rubiana Lagoon.

Two workers were found on the ground near the beach.

This species is distinguished from the preceding by its smaller size and the shape of the head, which is shorter, with more convex sides and with the occipital border more concave. The eyes are smaller. The color is reddish brown, except the petiole, postpetiole, and gaster which are brownish yellow.

78. Triglyphothrix obesa (Em. André).

Tetramorium obesum Em. André, Rev. entom., 1887, **6**, p. 294, ☿.

Male. Length 2.75 mm.

Head, excluding eyes, a little longer than broad, broadest behind eyes, posterior angles obtuse, border straight. Mandibles large and well formed, with large, triangular apical and subapical teeth. Clypeus convex, anterior border feebly rounded. Antennae robust, 10-jointed; scapes extending beyond posterior borders of eyes; first funicular joint globose; second joint two and one half times as long as broad and longer than the two succeeding joints together, third joint small; joints four to eight longer than broad, submoniliform; terminal joint slightly shorter than the two preceding joints together. Eyes large and convex, located at a distance of one fourth their longitudinal diameter from anterior corners of head. Ocelli large. Thorax robust, with strongly impressed Mayrian furrows. Scutellum little convex basally, margined at sides; spines reduced to broadly obtusely angulate lamellae. Petiolar node longer than high; from above subglobose and slightly broader than long. Postpetiole from above similar to petiole but broader. Legs long and slender.

Gaster and legs shining, the rest more feebly so. Mandibles punctate. Head irregularly striate, the striae longitudinal on front and clypeus, transverse between eyes and frontal carinae and oblique and somewhat reticulate on vertex and occiput.

Pronotum coarsely punctate, especially at sides. Mesonotum reticulately striate. Scutellum punctate. Epinotum and petiolar peduncle carinate. Petiolar node and postpetiole coarsely but shallowly punctate. Gaster and legs finely punctate.

Pilose everywhere, similarly to worker.

Color testaceous throughout. Wings hyaline, veins and the broad stigma yellowish.

Ugi: Pawa.

The many workers before me, agree closely with André's description and with workers from India received from Dr. Forel. This species, like the related species *striatidens* Emery which Forel has recorded from the Bismarck Archipelago but which I failed to find in the Solomons, appears to be extending its range.

79a. TRIGLYPHOTHRIX FULVICEPS Emery, subsp. ANTENNATA, subsp. nov.

Worker. Length 2.25–2.50 mm.

Head a little longer than broad, about as broad in front as behind, with convex sides, narrowly angled posterior corners and concave border. Mandibular blades 6-dentate, the three basal blades short, the others longer and acute. Clypeus rather strongly convex, sharply carinate at middle; anterior border feebly rounded. Antennal scapes almost attaining occipital corners; funicular joints two to eight slightly transverse; terminal joint longer than the two preceding joints taken together. Eyes large and convex, located at sides of head, a little in front of middle. Thorax robust, in profile evenly convex; from above, broad in front with rounded humeral angles and nearly straight sides. Base and declivity of epinotum not distinct; spines divergent, acute, about as long as distance between their bases. Petiolar node in profile as long as high, nearly straight in front, convex above and behind; from above, a little longer than broad, narrowest in front, with convex sides. Postpetiole transversely ovate; broader than petiole.

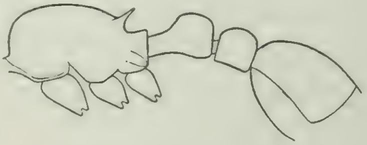


FIG. 30.— Triglyphothrix fulviceps antennata Mann. Worker. Lateral view of thorax and petiole.

Somewhat shining, the gaster and legs more so than the rest. Mandibles and clypeus coarsely striate. Head longitudinally striate, the striae becoming reticulate on vertex, sides, and occiput. Thorax, epinotum, petiole, and postpetiole coarsely, cribrately punctate. Gaster coarsely but shallowly punctate basally, more sparsely behind. Everywhere with abundant short silky hairs.

Head and legs, except part of femora, and antennae brownish yellow. The rest dark reddish brown, with the basal half of first gastric segment lighter than the other parts.

Santa Cruz: Graciosa Bay.

Described from specimens taken from a small colony beneath a stone and from several isolated workers.

Very close to typical *fulviceps* but the antennal scapes extend distinctly more than three fourths the distance to occipital corners, the petiolar node is not broader than long and the color is lighter.

80. TRIGLYPHOTHRIX MAYRI, sp. nov.

Worker. Length 1.75–2 mm.

Head a little longer than broad, as broad in front as behind, with slightly convex sides, rounded corners and moderately concave occipital borders. Mandibles with five short teeth, the apical and subapical longer than the others. Clypeus convex, carinate at middle, slightly rounded at anterior border. Antennal scapes extending a little more than three fourths the distance to occipital corners; funiculus stout, joints two to eight strongly transverse, terminal joint longer than the two preceding joints taken together. Eyes large and convex, located at sides of head at a distance equal to their longitudinal diameter from anterior corners. Thorax robust, evenly convex above. Epinotal spines triangular, rather stout, about as long as broad at base: episternal spines broader than long. Petiolar node in profile longer than high; the pedicel much shorter than node, from above, subglobose about as long as broad. Postpetiole a little broader than petiole and a little broader than long. Legs stout.

Subopaque, except mandibles, apical segments of gaster and legs which are shining. Mandibles punctate and indistinctly striate. Clypeus longitudinally striate. Head, thorax, petiole, and postpetiole densely and coarsely punctate, the thorax and epinotum faintly and irregularly carinulate. Epinotal declivity smooth. First gastric segment with large but shallow punctures over entire dorsum.

Densely covered with fine, short, white pilosity.

Color brownish yellow; gaster darker than the other parts.

San Cristoval: Star Harbor.

This species approaches *walshi* Forel from British India but differs in the shorter petiole to the first node, in the head being as broad in front as behind, in the finer striation of the mandibles, and in color. From the closely related *musculus* Forel *mayri* differs in the shape of the petiole which is not transverse. The punctation of the entire dorsum of the first gastric segment is distinctive.

Type.—M. C. Z. 9,178.

81. TRIGLYPHOTHRIX PULCHELLA, sp. nov.

Worker. Length 1.75–2 mm.

Head longer than broad, little broader behind than in front, with feebly convex sides, rounded posterior corners and shallowly concave border. Mandibles 6-dentate, the three basal teeth indistinct. Clypeus convex, carinate at middle, broadly rounded in front. Antennae stout, their scapes extending three fourths the distance to occipital corners, funicular joints two to eight transverse, terminal joint longer than the two preceding together. Thorax robust, humeral angles narrowly rounded. Epinotal spines slender, longer than the distance between them at base and strongly divergent. Petiolar node a little broader than long; pedicel short. Postpetiole a little broader than long and only slightly broader than the petiole.

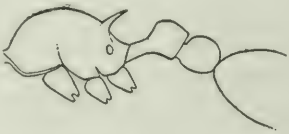


FIG. 31.— Triglyphothrix pulchella Mann. Worker. Lateral view of thorax and petiole.

Subopaque, except terminal half of gaster which is shining. Mandibles somewhat shining, punctate, and striolate. Head, thorax, epinotum (except declivous portion), petiole, and postpetiole coarsely and densely punctate. Basal half of first gastric segment punctate and longitudinally striate, the rest finely punctate. Legs and antennae somewhat shining and finely punctate.

Pilosity short, white, and abundant.

Color pale brown; legs, antennae and mandibles lighter, head yellow.

Female (deälated). Length 2.25 mm.

Similar to worker. The ocelli are small. The mesothorax and scutellum are rather flat and longitudinally carinate at middle. The striation at base of gaster is stronger than in the worker.

Malaita: Auki.

The very long, slender, and divergent spines readily distinguish this species. *Type.*—M. C. Z. 9,179.

Key to Papuasian Species.

Petiolar node distinctly longer than broad (Indo Malaya; Australia; West Indies; North America, Louisiana) .... *striatidens* Emery.
Petiolar node as broad or broader than long .... 1.
1. Larger species (length 2.5–3 mm.); mandibles not striate; gaster smooth and shining. (India; Solomons) .... *obesa* Em. André.
Smaller species (Length 1.75–2.50 mm.), mandibles striate; gaster punctate, at least basally .... 2.
2. First gastric segment not striate basally, coarsely but evenly punctate throughout; epinotal spines very short. (Solomons) .... *mayri* Mann.
First gastric segment striate and punctate basally; epinotal spines longer .... 3.
3. Epinotal spines long, slender and strongly divergent; color pale brown, with head yellow (Solomons) .... *pulchella* Mann.
Epinotal spines not longer than distance between them at base; color dark reddish brown to black, with head lighter .... 4.
4. Petiolar node broader than long; antennal scapes extending three fourths the distance to occipital corners; color black, with head and legs reddish brown. (New Guinea) .... *fulviceps* Emery.
Petiolar node not broader than long; antennal scapes almost attaining occipital corners; color dark reddish brown, head and gaster lighter. (Santa Cruz) .... *fulviceps* subsp. *antennatus* Mann.

82. Strumigenys godeffroyi Mayr.

Sitzungsb. Akad. wiss. Wien, 1866, **53**, p. 516, ☿.

Santa Cruz: Graciosa Bay. San Cristoval: Pamua, Wai-ai, Wainoni Bay. Three Sisters: Malapaina. Ugi: Pawa. Malaita: Auki. Ysabel: Fulakora.

This is a very common species. It nests beneath bark or stones or in rotten wood and has been found in Termitaria.

83. Strumigenys decollata, sp. nov.

Worker. Length 4 mm.

Form long and slender. Head twice as long as broad, twice as broad at occiput as at clypeus, with narrowly rounded occipital corners and strongly impressed occipital border; sides convex in occipital region, then evenly concave to and a little past the eyes, and then convex to the clypeal border. Clypeus flattened at base, acuminate behind; in front excavated broadly and triangularly, so that the sides form rectangular lobes. Antennal foveae well defined and margined as far as the eyes, then poorly defined and without margin. Scapes stout, extending less than two thirds the distance to occipital corners, about as long as mandibles; first funicular joint a little longer than the second and third, which are subequal and two and a half times as long as broad; terminal joint rather stout, one and a half times as long as the penultimate.

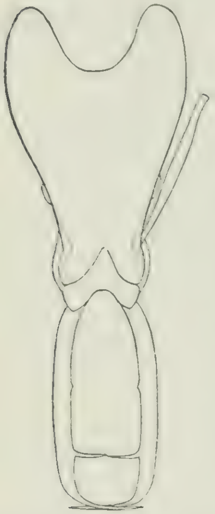


FIG. 32.— Strumigenys decollata Mann. Worker. Front view of head.

Mandibles long and arcuate, of equal thickness from base to near apex; the inner border a little before the middle has a small, but distinct triangular tooth and anterior to this a second, smaller tooth; midway between this and the terminal tooth is a slender tooth, more than half as long as the terminal ones; upper terminal teeth long and slender, the lower ones much shorter than the others and strongly twisted. Thorax long and slender, the sutures obsolete. Promesothorax narrowed anteriorly into a neck, which is feebly margined; broadest behind middle, with convex surface and rounded sides, evenly sloping behind to the epinotum. Epinotum in profile flattened basally, rounded at sides; armed with two stout triangular spines, which are about as long as the very short declivity. Peduncle in profile shorter than the node, which is nearly twice as long as high and feebly convex above; seen from above more than twice as long as broad, the sides subparallel to near the apex, then divergent. Postpetiole from above a little broader than long, campanulate in shape, broadest behind, narrowed in front, rounded above and at sides. Gaster short and stout. Legs long and slender.

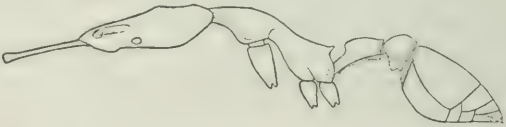


FIG. 33.— Strumigenys decollata Mann. Worker.

Mandibles shining, finely punctate. Clypeus shining, with scattered punctures. Head feebly shining, densely and reticulately punctate; vertex more finely than the rest. Thorax more shining, with widely separated, strong punctures. Base of epinotum smooth and very shining. Petiole shining, with moderately coarse punctation. Postpetiole more shining, with sparser punctation. Gaster very shining, finely and sparsely punctate. Legs somewhat shining and strongly punctate.

Occipital margin, mandibles, and tip of gaster with very sparse and fine erect pile. Scapes with a row of ten to twelve stout curved hairs, funiculus with appressed and glistening hairs. Legs with sparse, appressed hairs. Petiole and postpetiole with fungiform processes in a narrow band at the apical margins and more abundantly on the ventral surface. The greater part of the body is without erect pile or pubescence.

Color reddish brown; pilosity white.

Male. Length 2.25 mm.

Head, excluding eyes, longer than broad; sides rounded; occipital border shallowly concave between the posterior ocelli. Cheeks a third as long as the eyes. Clypeus convex basally, anterior border feebly concave. Mandibles short; bidentate at apex. Eyes convex, their longitudinal diameter as long as their distance from the posterior ocelli. Antennae 13-jointed; scape less than twice as long as it is broad at base; first funicular joint as thick as the scape and more than half as long; remaining joints very gradually becoming longer toward apex; terminal joint one and a half times as long as the penultimate. Pronotum flattened and collar-like in front. Mesonotum rounded above; with strong Mayrian furrows. Scutellum broader than long, rather flat in front, convex behind. Epinotum flattened basally; its very distinct declivous portion flat and broadly margined at sides. Petiole in profile rounded above, much longer than high; from above, twice as long as broad. Postpetiole a little longer than broad, rounded above and at sides; in profile a little longer than deep. Legs slender.

Head and thorax subopaque; very densely punctate. Petiole and postpetiole punctate at sides; above smooth and shining. Gaster very shining. Legs subopaque, with fine but dense punctation.

Antennae with abundant, glistening white oppressed hairs, as in the worker. Legs with a few fine hairs which are more abundant on the tarsi. The rest of the body is without pilosity except for a very few hairs on the thorax and apically on the gaster.

Color black; the head and thorax intensely so, the rest dilute.

Wings hyaline. Veins and stigma brown.

Ysabel: Fulakora.

84. STRUMIGENYS ANTAEUS, sp. nov.

Worker. Length 3.25 mm.

Near *S. chyzeri* Emery.

Head broadly cordate, deeply excavated behind, occipital corners narrowly rounded, sides strongly constricted in front of eyes; cheeks swollen basally, but not angulate. Clypeus flattened at base; convex in front, end divided into two lobes by the strong, triangular medial incision. Mandibles in length about equal to the distance from their base to the eyes; thickened in front of middle as in *chyzeri* and armed with two long teeth at apex and a short and curved tooth situated dorsally on the swollen position and not extending to the inner mandibular margin. Antennal scapes extending more than half the distance to occipital corners; funicular joints two and three scarcely longer than broad; fourth joint as long as the three preceding joints. Eyes little convex, composed of about twelve ommatidia. Prothorax flat above; margined at apical third of sides; humeral angles rounded, the disc with irregular carinae. Promesonotal suture marked by a carina. Mesonotum flattened basally, then declivous to the feeble mesoëpinotal impression; margined at sides. Epinotum with subequal base and declivity; base flattened, twice as long as broad and indistinctly margined at sides, declivity convex, twice as long as broad and sharply margined at sides; spines stout, half as long as base of epinotum. Peduncle of petiole longer than the node; node in profile rounded above; from above, longer than broad, with a margin of spongiform appendages behind. Postpetiole transverse, with a narrow border of spongiform appendages in front, on sides and behind. Legs long and rather stout.

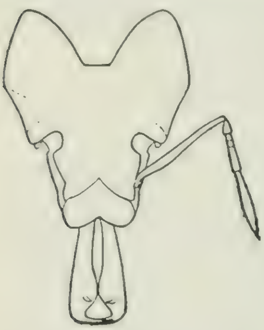


FIG. 34.— Strumigenys antaeus Mann. Worker. Front view of head.

Mandibles shining and rather closely punctate. Head, thorax, epinotum, and petiole feebly shining, granulosely punctate and with reticulate carinulae which are most abundant on the head, and lacking on the epinotum and petiole. Postpetiole and gaster more shining and densely punctulate. Legs somewhat shining, densely punctate. Head and body with scattered, erect, and strong pile; first gastric segment costate at base; pile of scapes and legs semierect and very strongly curved.

Color brownish yellow; mandibles darker.

Ysabel: Fulakora.

A number of workers were found beneath leaves on the ground and a colony in rotten wood. The deeply excavated clypeus readily distinguishes *antaeus* from *chyzeri* Emery which has the anterior border arcuate. The two species are closely related. *Strumigenys loriae* Emery from New Guinea has the short mandibular spine before the two terminal ones, situated dorsally, and the cheeks are markedly angulate midway between the eyes and the clypeus. *Type.*— M. C. Z. 9,180.

84a. STRUMIGENYS ANTAEUS Mann, var. FUSCIOR, var. nov.

Worker. Length 2–2.25 mm.

Differing from the preceding in its smaller side and in coloration, being reddish brown, with the gaster, except the apex much darker than the rest of the body.

San Cristoval: Pamua. Ugi: Pawa. Malaita: Auki.

Szabo (Ann. Mus. nat. Hung., 1910, 8, p. 368) states that Biro found in New Guinea large and small workers of *S. loriae* Emery, in the same nest, indicating polymorphism in the species. The specimens that I have separated from *antaeus* as the variety *fuscior* certainly are very similar in structure to the type form, but they were found always in separate colonies, the larger and smaller forms never together. I have seen no specimens intermediate in size between the two.

85. RHOPALOTHRIX ISABELLAE, sp. nov.

Worker. Length 3 mm.

Head about as long as broad; strongly excavated behind and with obtusely angulate corners; oblique portions of sides with straight margin. Clypeus narrowed behind and broadly and shallowly concave in front; the suture separating it from the front shallow and rather poorly defined. Mandibles strongly constricted at basal third and much more slender than in the related species. Antennal scapes at base about a third as broad as long; funicular joints two and three only slightly transverse, joints three and four longer than broad, terminal joint longer than the four preceding joints together. Pronotum shallowly impressed at middle and obtusely gibbous on either side; humeral angles rounded, without any indication of tubercles. Promesonotal suture obsolete. Mesonotum slightly convex in front, and depressed behind. Mesoëpinotal suture distinct. Base of epinotum strongly impressed mesally, marginate at sides of impression, separated from the concave declivous portion by an acute margin; spines short and obtuse apically, their bases extended as narrow lamellae along borders of declivity. Petiolar node longer than broad, slightly broadest apically and very feebly convex at sides and front; flat above; about as long as peduncle. Postpetiole one and a third times broader than long, narrowed in front, sides little convex; dorsal surface with a faint medial impression which terminates in front in a broad and shallow fovea; strongly

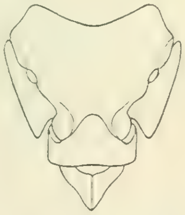


Fig. 35.—Rhopalothrix isabellae Mann. Worker. Front view of head.

impressed at apex and elevated into an obtuse tubercle on either side of impression. First gastric segment indistinctly impressed at middle of base.

Mandibles shining and punctate. Head feebly shining. Clypeus strongly and foveolately punctate; front reticulately and rugosely punctate; vertex with two large shallow foveae and cribriform punctures between. Promesothorax coarsely and reticulately costate and subopaque. Epinotum at sides more finely costate; impressed portion foveolately punctate; declivity smooth and shining. Petiole finely rugose. Postpetiole and gaster more shining and uniformly cribrate. Antennae and legs coarsely and densely subopaque.

Fine, squamiform hairs on head and antennal scapes, coarse ones on legs. Clavate hairs on legs, outer border of scape and one in each of the two foveae on vertex; fine hairs on funiculus, tarsi, and ventral surface of gaster.

Fuscopiceous; legs, mandibles, antennae, and lamellate borders of epinotum fuscorufous. Hair white.

Ysabel: Fulakora.

The single worker of this anomalous species was found beneath a log in the forest. The curious form of the mandibles and the relatively long postpetiole readily distinguish *isabellae* from the other Papuasian species. The lack of clavate hairs on the dorsal surface is probably not due to their being rubbed off, for such hairs are abundant on the legs.

86a. RHOPALOTHRIX PROCERA Emery, subsp. MALUA, subsp. nov.

Male. Length 3 mm.

Head, excluding eyes, much longer than broad; sides posterior to eyes parallel, then oblique to the occipital border which is shallowly concave. Vertex broadly and deeply impressed between the ocelli. Frontal carinae strongly elevated. Clypeus convex; concave anteriorly and angulate at sides. Mandibles small and acuminate apically. Antennae slender, scape broad basally, twice as long as first funicular joint; first funicular joint about a third as long as the second; joints two to eleven elongate and cylindrical, becoming shorter toward apex; terminal joint one and a half times as long as penultimate. Eyes shorter than border of clypeus, very convex. Mesothorax flattened posteriorly and impressed at middle. Scutellum about as long as broad, and rather flat above. Epinotal spines rounded apically. Petiolar node as long

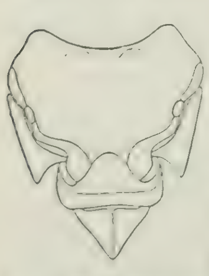


FIG. 36. — Rhopalothrix procera malua Mann. Worker. Front view of head.

as broad; impressed at middle of posterior border; anteroventral spine long and slender. Postpetiole much broader than long; with a short longitudinal impression at middle of apex.

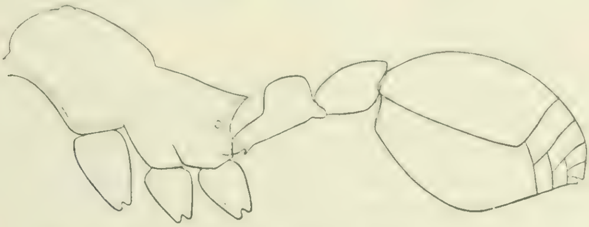


FIG. 37.— Rhopalothrix procera malua Mann. Worker. Lateral view of thorax, petiole, and abdomen.

Opaque, except gaster and legs which are very faintly shining. Densely and coarsely punctate throughout, with the punctation of gaster and legs somewhat more shallow than the rest. Above with sparse, semiclavate hairs and scattered fine and recumbent pilosity, ventral surface and coxae with fine, long, and erect hairs. Legs and antennae with recumbent pilosity.

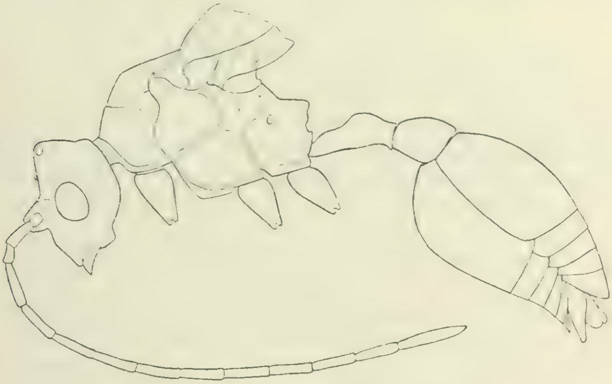


FIG. 38.— Rhopalothrix procera malua Mann. Male. Lateral view.

Black; mandibles, antennae, lamellate extensions of epinotal spines, apex of gaster and legs, except coxae, fuscoferruginous.

Wings (length 3.5 mm.) strongly infuscated; veins brown.

Santa Cruz: Graciosa Bay. San Cristoval: Pamua, Wainoni Bay, Wai-ai. Three Sisters: Malapaina. Ysabel: Fulakora. Rendova.

A large series of workers from several localities agree with Emery's description of *procera* except that the postpetiole is not margined at sides and the size averages smaller. (Length 3–3.5 mm.)

The female is distinctly smaller (Length 4 mm.) than in typical *procera*, though agreeing in other respects. The wings are rather strongly infuscated, with brown veins.

Small colonies were found between layers of rotten wood or beneath bark when there was moisture. It is a very slow moving species.

There is considerable variation in the color of the workers, from rufotestaceous to rufofuscous, though none approach the very dark [illegible] f the following variety. *Type.*—M. C. Z. 9,181.

86b. RHOPALOTHRIX PROCERA Emery, subsp. MALUA Mann, var. MELANOTICA, var. nov.

A single worker from Tulagi is different from any of the large series of the preceding form before me in being piceofuscous in color, much darker than the most extreme of subsp. *malua*.

Key to Papuasian Species.

Smaller species, less than 2 mm. in length .... 1.
Larger, more than 2 mm. in length .... 3.
1. Petiolar node not longer than broad; front with a transverse impression between clypeus and vertex (New Guinea) .... *brevicornis* Emery.
Petiolar node twice as long as broad; front without transverse impression .... 2.
2. Head broader; very shallowly and broadly excavated behind. (New Guinea) .... *punctata* Szabo.
Head narrower, more deeply and narrowly excavated behind. Head, thorax, and abdomen with clavate and squamiform hairs intermingled. (New Guinea) .... *mixta* Szabo.
3. Oblique portions of sides of head convex in outline; occipital border feebly concave; supraocular portion of head with squamiform scales. Length 2.3 mm. (New Guinea) .... *biroi* Szabo.
Oblique portions of sides of head slightly concave in outline; occipital border strongly concave; hairs on front uniformly distributed ...... 4.
4. Outer border of mandibles strongly concave before middle, so that the apical portions are slender. Humeral angles evenly rounded. (Solomons) .... *isabellae* Mann.
Mandibles of usual form, not constricted. Humeral angles subgibbous 5.

5. Postpetiole margined at sides. Length 3.5–4.5 mm......*procera* Emery.
Postpetiole not margined at sides. Length 3.–3.5 mm...............6.
6. Color fuscoferruginous (Solomons)..........*procera* subsp. *malua* Mann.
Color piceous. (Solomons)..*procera* subsp. *malua* var. *melanotica* Mann.

DOLICHODERINAE.

87. TURNERIA PACIFICA, sp. nov.

Worker. Length 2.25 mm.

Head a little longer than broad, nearly as broad in front as behind, with convex sides and very shallowly concave posterior border. Mandibles with six teeth, the third and fifth smaller than the others. Anterior border of clypeus almost straight except at sides, where it is concave; posterior border broadly rounded. Frontal area obscure. Frontal carinae very feeble, extending a little beyond anterior border of eyes. Eyes elongate, large, nearly a third as long as head; situated on sides of front, a little posterior to middle. Antennal scapes slender, almost attaining occipital corners; funicular joints longer than broad. Pronotum slightly broader than long, surface rather flat; humeri with an elevated, elongate process, like a short carina. Mesonotum longer than broad. Mesoëpinotal impression broad and deep. Base of epinotum convex, subtriangular, truncate behind; in profile the posterior margin appearing bluntly cone-shaped and extending over the short and very concave declivity. Scale twice as high as long, convex in front, straight behind, rounded above. Gaster short, oval.

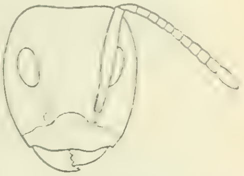


FIG. 39.— Turneria pacifica Mann. Worker. Front view of head.

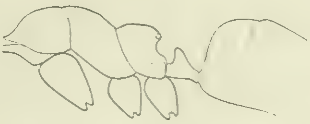


FIG. 40.— Turneria pacifica Mann. Worker. Lateral view of thorax and petiole.

Occiput and gaster shining, the rest subopaque; very finely punctate throughout; and microscopically pruinose. Clypeus and front with a few erect hairs.

Gaster black, the remainder yellow-brown; terminal joint of funiculus darker.

Santa Cruz: Graciosa Bay.

Described from a single worker.

This is the fourth species of Turneria. Nothing is known regarding the habits of these interesting ants.

Key.

1. Eyes smaller, hemispherical. Thorax margined. Smooth and shining color black. Length 2–8 (Australia) . . . . *frenchi* Forel.
   Eyes large and flat. Thorax not margined, or only pronotum with short margin. Subopaque species . . . . 2.
2. Funicular joints as broad as long; antennal scapes extending only slightly beyond border of eyes. Mesonotum twice as long as broad. Reddish brown, gaster blackish, funiculus brown. Length 2.5–2.7 mm. (Queensland) . . . . *bidentata* Forel.
   Funicular joints longer than broad; antennal scapes almost attaining occipital borders of corners of head. Mesonotum less than twice as long as broad . . . . 3.
3. Pronotum much broader than long. Black; legs and funiculus dark brown, mandibles, front of head, scapes, and tarsi yellow. Length 2.2–2.3 mm. (Bismarck Archipelago) . . . . *dahli* Forel.
   Pronotum but little broader than long. Yellow-brown; gaster black. Length 2.25 mm. (Santa Cruz) . . . . *pacifica* Mann.

88. IRIDOMYRMEX MYRMECODIAE Emery.

Iridomyrmex cordatus var. *myrmecodiae* Emery, Ann. Mus. civ. stor. nat. Genova, 1887, **24**, p. 249, ☿.

Santa Cruz: Graciosa Bay. Santa Anna. Three Sisters: Malapaina. Malaita: Auki. Ysabel: Fulakora. Florida: Tulagi. San Cristoval: Wai-ai.

This is one of the most abundant ants in the Solomons. It nests sometimes beneath bark or in crevices on standing trees, but usually in bulbs of an epiphyte, Myrmecodia sp. (?*M. guppyanum*), which grows on the branches of several species of trees and is especially common on a lowland-inhabiting species of Barringtonia. It has been shown that Myrmecodia can thrive without the presence of ants, but I am sure that few of this species do, for among the many that I cut open, none were without them. Even very young bulbs, less than an inch in diameter, contained incipient colonies.

There is considerable variation in color among the very large series before me. The Santa Cruz examples and some from Wai-ai have the gaster jet black; in the majority of the specimens it is more dilute.

89a. IRIDOMYRMEX ANCEPS Roger, subsp. PAPUANUS Emery.

Ann. Mus. civ. stor. nat. Genova, 1897, **38**, p. 572, ☿.

New Georgia. Rubiana Lagoon.

Three workers agree closely with Emery's description.

Two additional species of Iridomyrmex among my material are represented only by worker minors.

90. IRIDOMYRMEX RUFONIGER (Lowne) var.?

Formica rufonigra Lowne, Ent., 1865, **2**, p. 279.

Malaita: Auki.

Several workers were found on trunks of trees near the beach.

91. IRIDOMYRMEX DIMORPHUS Viehmeyer.

Abh. berichte K. zool. anthr.-ethn. mus. Dresden, 1912, **14**, no. 1, p. 7, pl. 1, fig. 7, 7a, 7b, ☿.

Worker. Length 4–6 mm.

Head a little longer than broad, moderately narrowed in front, posterior corners narrowly rounded, border deeply concave. Mandibles stout, with a larger blunt apical tooth and four to eight smaller teeth. Clypeus slightly convex, anterior border straight. Frontal carinae very short. Antennal scapes barely attaining occipital corners; first funicular joint a little longer than the second; second joint one and two thirds as long as third, remaining joints gradually increasing in thickness. Eyes large, not very convex, situated in front of sides anterior to middle. Pronotum broader than long, evenly rounded above and at sides. Mesonotum elongate oval, twice as long as broad. Mesoëpinotal suture broadly impressed, with prominently tuberculate spiracles. Base of epinotum rounded, twice as long as broad; a little longer than the declivity into which it broadly rounds. Petiolar node thick, in profile triangular above, sides narrow. Legs very long and slender.

Shining. Mandibles rugulose. Finely punctate and covered with pruinose pubescence, which is most dense on gaster and thoracic pleurae. Rather stiff erect hairs scattered on head, body, and appendages.

Black. Mandibles and funiculus brown.

Malaita: Interior near Gwountafu. Ysabel: Fulakora.

Described from numerous workers that were travelling across a path.

Workers were kindly compared by Professor Emery with cotypes, who writes that they are identical with the smaller workers of *dimorphus*, though the largest of the type lot is much longer (9 mm.) than any that I found.

92. TECHNOMYRMEX ALBIPES (F. Smith).

Formica (tapinoma) albipes Smith, Journ. proc. Linn. soc. Zool., 1862, **6**, p. 38, ☿.

San Cristoval: Wai-ai, Wainoni Bay. Ugi: Pawa. Bio. Malaita: Auki. Ysabel: Fulakora.

An abundant species, nesting beneath stones, logs, or bark, or in little shelters made of vegetable debris on leaves. It is fond of attending scales. One nest sheltered two pupae of a myrmecophilous fly, (Bardistopus sp. nov.) from which I reared adults.

CAMPONOTINAE.

93. ACROPYGA (ACROPYGA) MOLUCCANA Mayr, subsp. PAPUANA, subsp. nov.

Worker. Length 2.5–2.75 mm.

Differing from typical *moluccana* as figured by Emery (Ann. Mus. civ. stor. nat. Genova, 1900, **40**, p. 698, fig. 13a) only in the shape of the head, which has the sides much less convex, more as in *crassicornis* Emery, but differing from the latter in having occipital border concave and the penultimate antennal joint a little longer than broad, instead of transverse. The tegument is feebly shining. The color is brownish yellow.

Ugi: Pawa (Type-locality). Malaita: Auki. San Cristoval: Wainoni Bay, Star Harbor. Ysabel: Fulakora.

A very common species, found in populous colonies beneath stones or logs. *Type.*— M. C. Z. 9,182.

93a. ACROPYGA (ACROPYGA) MOLUCCANA Mayr, var. OPACA Stitz.

Sitzungsb. Gesellsch. nat. freunde Berlin, 1911, p. 370, ☿.

Malaita: Interior near Gwountafu.

I am referring with doubt to this variety several workers and a female which are darker in color and somewhat less shining than the preceding form.

94. ACROPYGA (RHIZOMYRMA) LAUTA, sp. nov.

Worker. Length 1.50 mm.

Near *oceanica* Emery.

Head a little longer than broad, as broad in front as behind; sides feebly convex; posterior angles rounded, border slightly concave. Mandibles narrow, with four separated, acute teeth. Clypeus truncate at middle of front, obtusely angulate at side of truncated portion. Antennal scapes not attaining occipital corners; first funicular joint more than twice as long as broad; second joint campanulate, longer than broad; joints three to six a little broader than long; terminal joint as long as the three preceding joints. Eyes minute, situated in front of sides of head at anterior third. Thorax stout. Posterior half of pronotum strongly convex, in front concave. Mesonotum longer than broad, rather flat above. Epinotum with base convex and evenly rounding into the declivity, which is flattened and twice as long as the base. Petiolar node erect, narrow. Gaster elongate.

Shining throughout. Mandibles punctate. Head and gaster with dense, fine, and shallow punctation, which is somewhat coarser on the gaster.

Head, gaster, and legs finely and densely pubescent, thorax and epinotum sparsely so.

Color yellow; head slightly darker, mandibular teeth brownish to black.

Female. Length 2.25.

Head broader than long. Ocelli large. Frontal sulcus shallow. Eyes a third as long as head, feebly convex. Antennal scapes slightly surpassing occipital corners.

Wings (length 2.75 mm.) hyaline, veins and stigma fuscous.

San Cristoval: Pamua, Wainoni Bay. Malaita: Auki.

Workers and females in a small series taken from beneath a stone differ from Emery's descriptions and figure of *oceanica* in having the head longer, the occipital border distinctly though shallowly concave instead of truncate, and the frontal lobes divided by a broad triangular space. *Type.*— M. C. Z. 9,183.

95. PLAGIOLEPIS LONGIPES (Jerdon).

Formica longipes Jerdon, Madras journ. litt. sci., 1851, **17**, p. 122, ☿.

Santa Cruz: Graciosa Bay. Throughout the Solomons.

Plagiolepis longipes occurred in all the localities visited; it belongs to the group of insects that is rapidly being distributed throughout the world, and associated indirectly with man. Like the other members of this anthropophilus fauna, it prefers to nest in cleared land, under stones, logs, or debris, or in the ground. I frequently found it in the forest, but on every occasion, it is interesting to note, there were signs of former native villages or clearings, indicating that the species invariably establishes its colonies in the vicinity of human habitations.

96. PRENOLEPIS (NYLANDERIA) LONGICORNIS (Latreille).

Formica longicornis Latr., Hist. nat. fourmis, 1802, p. 113, ☿.

Santa Cruz: Graciosa Bay. Santa Anna.

This species was found in all the localities visited.

97a. PRENOLEPIS (NYLANDERIA) MINUTULA Forel, subsp. ATOMUS Forel.

Mitt. Zool. mus. Berlin, 1901, **2**, heft 1, p. 25, ☿.

Ugi: Pawa. Ysabel: Fulakora.

Occurs in small colonies beneath stones.

98. PRENOLEPIS (NYLANDERIA) VIVIDULA Nylander.

Acta Soc. sci. Fenn., 1846, **2**, p. 900, ☿ ♀ ♂.

Ugi: Pawa.

99a. PRENOLEPIS (NYLANDERIA) OBSCURA Mayr, subsp. BISMARCKENSIS Forel.

Mitt. Zool. mus. Berlin, 1901, **2**, heft 1, p. 26, ☿ ♀ ♂.

San Cristoval: Wainoni Bay. Ysabel: Fulakora.

100. PRENOLEPIS (NYLANDERIA) STIGMATICUS, sp. nov.

Worker. Length 2.25–3.25 mm.

Head elongate nearly as broad in front as behind; sides slightly convex; posterior border nearly straight. Mandibles slender, arcuate with six acute triangular teeth, the third and fifth distinctly smaller than the others. Clypeus convex, broadly rounded in front. Antennae very long and slender, their scapes surpassing occipital corners by five eighths their length; first funicular joint nearly twice as long as the second; joints three to seven about four times as long as broad; joints eight to ten a little shorter; terminal joint shorter than the two preceding joints together. Eyes large and convex, situated in front of sides a little anterior to middle. Pronotum about as long as broad, slightly convex. Mesonotum much longer than broad; the flat mesoëpinotal suture strongly impressed. Basal portion of epinotum very convex and rounding into the flat declivous surface which it equals in length; stigmata situated at middle of sides of declivity prominently tuberculate. Petiolar node broadly cuneiform.

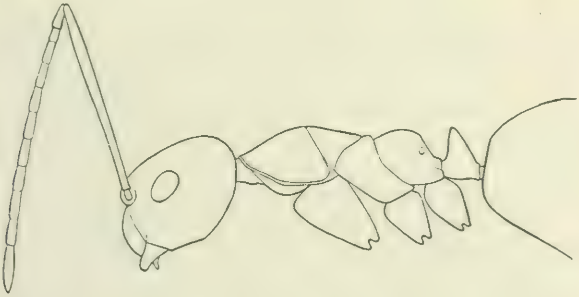


FIG. 41.— Prenolepis (Nylanderia) stigmaticus Mann. Worker. Lateral view of head, thorax, and petiole.

Shining, with shallow microscopic punctures on head. Mandibles subtly punctate.

Very coarse, stiff hairs moderately abundant on head, body, and appendages.
Color pale brownish yellow throughout.
Hairs black.

San Cristoval: Wai-ai (Type-locality). Ugi: Pawa. Three Sisters: Malapaina.

A very distinct species, resembling *steeli* Forel in the variation in size among workers from the same colony, but differing in having the antennal joints longer, in the flattened mesonotum, and in sculpture.

101a. OECOPHYLLA SMARAGDINA Fabricius, var. SUBNITIDA Emery.

Ann. Soc. ent. France 1892, **60**, p. 565, ☿.

Ugi: Pawa. San Cristoval: Wai-ai. Santa Anna. Three Sisters: Malapaina. Bio. Malaita: Auki. Florida: Tulagi. Russell: Yandina: West Bay. Ysabel: Fulakora. Guadalcanar: Rere.

This species was exceedingly abundant in certain localities. On Malapaina, where trees were being felled, it occurred in such numbers as to seriously interfere with collecting. Their nests had been destroyed by the falling of the trees and the workers were very pugnacious. The larger workers are able to bite appreciably and, during the several days that I spent collecting among the branches there were few moments in which one or more were not biting me.

102. OPISTHOPSIS MANNI Wheeler.

Bull. M. C. Z., 1918, **62**, p. 361, pl. 3, fig. 25, 26, ☿ ♀.

San Cristoval: Wai-ai. Three Sisters: Malapaina. Malaita: Auki. Russell: Yandina.

This is an arboreal species. The only colony that I found consisted of about a dozen workers and a deälated female. It was beneath a piece of loose bark on a recently felled tree. The workers move with such rapidity that it is almost impossible to collect them without injury.

103. Camponotus (Myrmoturba) maculatus Fabricius, subsp. nova hollandiae Mayr, var. papua Emery.

Lorentz's Nova Guinea, 1911, **9**, p. 256, ♃.

Santa Cruz: Graciosa Bay. San Cristoval: Wai-ai, Wainoni Bay. Ysabel: Fulakora.

103a. Camponotus (Myrmoturba) maculatus Fabr., subsp. sanctae crucis, subsp. nov.

Soldier. Length 7.5–8 mm.

Head short and broad, slightly narrowed in front; broadly but very shallowly excised posteriorly, posterior corners rather prominent. Mandibles stout, 6–toothed. Clypeus broadly rounded at anterior border. Antennae slender, their scapes extending about one fifth their length past the occipital corners.

Shining; finely shagreened. Mandibles shining, punctate, and striate apically. Clypeus, front, and cheeks with coarse piligerous punctures.

Hairs yellow, erect, and sparse, long on body, shorter on head; very sparse on appendages.

Reddish brown; head and gaster a little darker than the rest.

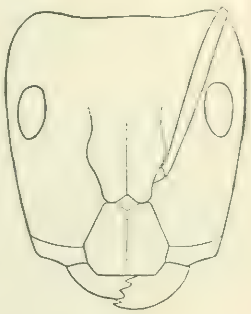


Fig. 42.— Camponotus (Myrmoturba) maculatus sanctae crucis Mann. Worker major. Front view of head.

Santa Cruz: Graciosa Bay, Santa Anna.

Resembles *nova hollandiae* var. *humilior* Forel, from Queensland, but has the head broader and shorter, with the clypeal lobe less produced and with its anterior border broadly rounded instead of truncate; the head is not strongly infuscated as in *humilior.*

A very abundant ant, nesting in cavities of trees and in rotten wood.

104a. Camponotus (Mayrmamblys) reticulatus Roger, var. bedoti Emery.

Camponotus bedoti Emery, Rev. Suisse zool., 1893, **1**, p. 196, ☿.

Santa Cruz: Graciosa Bay. Santa Anna. Malaita: Auki. Russell: Yandina. Guadalcanar: Rere. Bio. Florida: Tulagi. Rendova. New Georgia. Rubiana Lagoon.

105. CAMPONOTUS (COLOBOPSIS) GUPPYI, sp. nov.

Soldier. Length 5 mm.

Head longer than broad, narrowest in front, sides in front of eyes slightly convex, truncated portion separated from the front by a rounded angle. Mandibles 5-dentate. Clypeus two thirds on truncated portion, margined at sides; the posterior third longitudinally impressed at middle, carinate between this impression and the lateral border; anterior portion with a sharp median carina, anterior border straight. Frontal area broadly triangular. Frontal carinae moderately divergent, extending to a point opposite middle of eyes. Eyes situated on sides of front, back of posterior third of head.

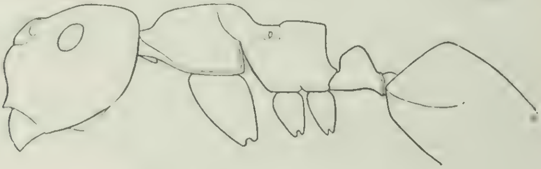


FIG. 43.— Camponotus (Colobopsis) guppyi Mann. Worker major. Lateral view of head, thorax, and petiole.

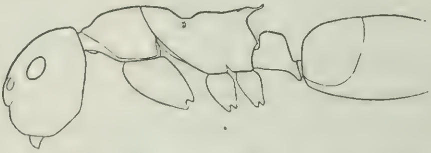


FIG. 44.— Camponotus (Colobopsis) guppyi Mann. Worker minor. Lateral view of head, thorax, and petiole.

Antennae stout, their scapes surpassing occipital corners by a distance a little greater than their diameter at tips. Pronotum rather flat, sides rounded. Mesonotum a third broader than long. Mesoëpinotal impression deep and nearly half as long as the basal portion of epinotum. Base of epinotum broader than long and truncate behind; in profile shorter than the concave declivity, over which it slightly projects. Petiolar node in profile about as long as high with declivous anterior and slightly sloping posterior surface, but little narrowed above; from above about twice as long as broad, with narrowly rounded and submargined sides. Gaster elongate, oval. Legs rather stout.

Moderately shining. Mandibles rugulosely striate. Anterior portions of front and cheeks with stout rugose striae. Head subtly, reticulately striate, the remainder with dense, though microscopic striae, which are seriolate on thorax and transverse on gaster.

Head and gaster with a very few erect hairs.

Pale reddish brown, with fuscous blotches on the vertex, lateral blotches on the gaster and dorsal ones on the base of the first, and the middle of the second and margin of the third segments. Antennal scapes infuscated apically; first funicular joint yellowish brown, remainder of funiculus black. Femora dark reddish brown to black, except from a yellowish area on flexor surface; basal three eighths of tibiae yellow-brown the remainder dark brown, almost black.

Worker (*media*). Length 4 mm.

Head a little longer than broad, slightly narrowed in front, with rounded corners and posterior border. Clypeus convex, obscurely carinate at middle, with nearly straight anterior border. Antennal scapes surpassing occipital borders by nearly half their length. Pronotum a little broader than long. Mesonotum longer than broad, separated from epinotum by a broad saddle-shaped impression. Base of epinotum flat; at apex developed as a lamellate projection, deeply concave and elevated and bilobed at tip (somewhat scoop-shaped), in profile projecting over the very concave declivity about as far as the declivity is high. Petiolar scale similar to that of soldier, but more strongly narrowed at sides. Gaster elongate oval.

Less shining, than soldier, very densely and finely and seriolately striate throughout.

Erect hairs very sparse on head and gaster.

Color as in soldier.

Worker (*minor*). Length 3 mm.

Differing from the above in its somewhat longer antennal scapes and in the more extreme prolongation of the lamellate posterior border of the epinotum.

Malaita: Auki.

This extraordinary species is described from a small series of isolated workers and a single soldier, found on leaves at different times about the government residence at Auki and on the trail to Aisisiki.

In the structure of the epinotum it is markedly different from all other species belonging to the subgenus, and the coloration is exceedingly characteristic. *Type.*— M. C. Z. 9,184.

106. CAMPONOTUS (COLOBOPSIS) ELYSII, sp. nov.

Soldier. Length 6.5 mm.

Form rather slender.

Head a fourth longer than broad, sides subparallel, border slightly convex. Mandibular blades with four teeth apically and two poorly defined ones basally. Clypeus strongly carinate, somewhat narrowed and with an elevated margin at anterior third of sides, anterior border nearly straight; posterior three eighths above depressed portion barely more than twice as broad as long. Antennal scapes nearly, but not quite attaining occipital corners. Frontal area small, about twice as broad as long; frontal carinae slightly sinuous, moderately divergent, extending to a point about opposite middle of eyes. Eyes smaller than is usual in Colobopsis, flat, situated in front of sides, well posterior to middle. Pronotum and mesonotum moderately convex, each broader than long. Thoracic sutures weakly impressed. Base of epinotum broad and convex; declivity slightly concave, the two surfaces broadly rounding into each other. Petiolar node in profile, twice as high as long, narrowed, submargined dorsally; from above, four times as broad as long. Gaster elongate. Legs stout.

Shining. Mandibles finely rugulose and with sparse, large punctures. Clypeus and anterior border of cheeks with short, rugose striae; remainder of head and body subtly and very densely seriolately striolate, with scattered distinct, though fine, punctures on front between carinae.

Pale yellow-brown, the gaster and a spot on vertex darker.

Worker. Length 4 mm.

Head a little longer than broad, evenly rounded behind, cheeks parallel. Clypeus convex, rounded anteriorly, not carinate. Antennal scapes surpassing occipital corners by a little less than half their length. Front strongly impressed between the carinae. Frontal carinae short, nearly straight, extending to opposite anterior third of eyes. Base of epinotum compressed and narrowly convex above, about four times as long as broad; in profile narrowly rounded between base and declivity.

Petiolar node cuneiform, with convex anterior and straight posterior surfaces, dorsal margin acute.

Sculpture as in soldier, except that the rugae on clypeus and anterior portion of cheeks are lacking.

Color pale reddish brown throughout.

Three Sisters: Malapaina (Type-locality). San Cristoval: Wainoni Bay.

Near *sommeri* Forel, from New Caledonia and *fictor* Forel from Australia, but with the head much narrower and more elongate.

The San Cristoval specimens are a little darker than those from Malapaina, which may not be fully colored.

107. CAMPONOTUS (COLOBOPSIS) LOA, sp. nov.

Soldier. Length 4.5 mm.

Head longer than broad, sides subparallel, posterior angles broadly rounded, border convex; rounded between anterior impressed portion and dorsal surface. Mandibles 5-dentate. Clypeus with five eighths of its length on the truncated portion, quadrangular, distinctly margined laterally and straight at anterior border; strongly bicarinate for entire length, the carinae converging anteriorly, and with two lateral carinae on basal three eighths. Frontal area poorly defined, broadly triangular. Frontal carinae slightly divergent, nearly straight, extending to a point a little in front of middle of eyes. Antennal scapes surpassing occipital corners by a distance equal to their width at tips; funicular joint as long as the second and third together. The remaining joints, except the terminal, gradually shorter and stouter; terminal joint as long as the two preceding joints together. Eyes large and flat; situated at posterior third of head. Thorax robust. Pronotum but slightly convex above, humeri broadly rounded. Mesothorax rather flat,

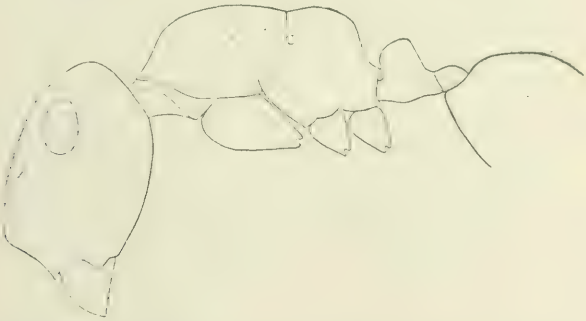


FIG. 45.— Camponotus (Colobopsis) loa Mann. Worker major. Lateral view of head, thorax, and petiole.

one and a third times as broad as long. Base of epinotum moderately convex, about as long as broad, rounding into the declivity, which is flat and a little longer than base. Petiolar scale in profile less than twice as high as thick, slightly convex in front, straight behind and flattened dorsally; from above, twice as broad as long, narrowly rounded and submargined laterally. Gaster elongate, legs stout.

Moderately shining. Mandibles rugulose and striolate. Truncated portion of head more shining than the rest, the impressed surfaces lateral to the clypeus uneven and shallowly punctate. Cheeks anteriorly with a series of short, irregular rugose carinae; the remainder of head shallowly and reticulately punctate. Thorax and abdomen very subtly reticulostriolate.

Head and body with a very few long erect hairs. Fine and short recumbent hairs on head and gaster.

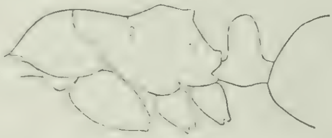


Fig. 46.— Camponotus (Colobopsis) loa Mann. Worker minor. Lateral view of head, thorax, and petiole.

Reddish brown; mandibular teeth black; head with a fuscous blotch on apex; basal two thirds of first, and apical two thirds of second and apical one half of remaining gastric segments black.

Worker (*minor*). Length 2.5–3 mm.

Head longer than broad, slightly narrowest in front, occipital corners rounded, border nearly straight. Clypeus large and convex, very obtusely carinate, anterior border shallowly concave at middle. Frontal carinae moderately divergent, extending to a point opposite anterior third of eyes. Antennal scapes surpassing occipital corners by about one third their length. Eyes large, little convex, situated in front of sides a little posterior to middle. Pronotum rather flat above, broadest at middle with sides narrowly rounded. Mesonotum broader than long, moderately narrowed behind, with straight sides. Base of epinotum compressed and narrowly convex; produced at apex as a short slightly projecting connule; declivity concave in profile and a little shorter than the base. Petiole and gaster as in soldier.

Moderately shining. Gaster with very dense, short transverse striolae, the remainder of body and the head subtly and seriolately striolate.

Sparse, scattered, erect hairs, and very fine and short recumbent hairs on head and gaster.

Pale yellow-brown; head posterior to antennal insertions darker, gaster black, each segment with a yellowish band apically.

San Cristoval: Wai-ai (Type-locality). Santa Cruz: Graciosa Bay. Santa Anna. Three Sisters: Malapaina. Ugi: Pawa. Malaita: Auki.

Described from numerous soldiers and workers taken from colonies nesting in hollow vines at Wai-ai and from workers and soldiers found running on leaves. There is considerable variation in the amount of infuscation on the head and the Malapaina and Auki specimens are pale in color, perhaps being varietally different, but more probably not fully colored.

Camponotus loa is near *C. conithorax* Emery, from the New Hebrides, but differs in size, color, and in the more convex base of epinotum. *Camponotus conica* Mayr. from Tonga has the epinotum similarly shaped in the worker but the petiolar node is armed with two spines. *Type.*—M. C. Z. 9,185.

107a. CAMPONOTUS (COLOBOPSIS) LOA Mann, var. BELLI, var. nov.

Several workers and soldiers found running about on the trunks of a recently felled tree agree in habits and sculpture with the type form, but in the soldier the front of head, the cheeks, thorax, epinotum, and petiole, and the middle and hind femora are dark brown, almost black. The anterior femora are mostly black, but blotched with yellowish brown. The light-colored bands on the otherwise black gaster are much narrower. The worker is black, except on the extreme anterior border of clypeus, the mandibles, antennae, tibiae, and tarsi, which are pale brown.

Florida: Tulagi.

108. POLYRHACHIS (HEDOMYRMA) SANTSCHI, sp. nov.

Worker. Length 5 mm.

Head longer than broad, broadly rounded behind, sides in front of eyes moderately convex. Clypeus subcarinate at middle, broadly sloping at sides, bidentate at middle of anterior border. Antennal scapes surpassing occipital corners by more than half their length. Pronotum longer than broad, slightly convex in profile, margined laterally; humeral spines broadened basally with the inner corners angulate, apical three fourths slender, compressed and acute at tips; extending forward and outward and bent downward. Mesonotum and basal portion of epinotum flat in front, shallowly concave between the spines, together shorter than the declivity; spiracular tubercles at margin of declivity large. Epinotal spines long, stout at basal two fifths, then slender; little divergent, their distance apart at tips about equal to their length, directed backward and upward. Petiole broader than long, sloping above, anterior border straight, posterior border curved and at middle subgibbous; spines rather thick at basal half, slender apically, a third longer than their distance apart at base, extended parallel to sides of first gastric segment.

Moderately shining. Mandibles finely striate. Head, thorax, and base of epinotum with strong, regular and entire striae, which are transverse on posterior portion on cheeks, oblique on clypeus, and longitudinal on thorax and epinotum. Epinotal declivity and posterior surface of petiole rugose. Gaster finely and densely rugulose.

Front and vertex with very sparse, long, erect hairs. Head and thorax with a thick covering of rich golden pubescence.

Black throughout.

Florida: Maliali.

Described from a unique worker. The curious, strong, and regular sculpture and the slender downward, curved humeral spines are very characteristic.

108a. POLYRHACHIS (HEDOMYRMA) SANTSCHI Mann, subsp. CAMPBELLI, subsp. nov.

Several workers differ from the typical form in having the golden pubescence on gaster more dense, the petiolar spines shorter and in the sculpture of the head. The striae of vertex extend longitudinally back to the posterior border of the occiput at the middle where they are met obliquely by transverse striae that extend down the sides of the occiput and cheeks. In *santschi* the occipital region is transversely striate.

Russell: West Bay.

In both forms of the species the epinotal spines are strongly longitudinally striate on the basal half. *Type.*— M. C. Z. 9,192.

109. POLYRHACHIS (HEDOMYRMA) GEMINATUS, sp. nov.

Worker. Length 5 mm.

Head slightly longer than broad, sides in front of eyes feebly convex, posterior border broadly rounded. Clypeus convex, obtusely carinate; lobed and acutely bidentate at middle of anterior border. Frontal carinae not widely separated, moderately elevated, parallel behind. Eyes convex, situated at posterior corners of head. Pronotum narrowly margined at sides, one and one third times broader than long, broadest behind; sides convex at posterior two thirds, in front concave; humeri developed as broad, lamellate lobes with elevated margins, apically concave and bidentate, the outer tooth elongate and spinose, the inner one rounded at tip. Mesoëpinotum without suture or constriction, much shorter than pronotum, flat except between spines where it is concave. Basal and declivous portions of epinotum rounding into each other; declivity much longer than base. Epinotal spines less than twice as long as their distance apart at base, stout, rather strongly curved downward. Petiolar node in profile with anterior and posterior surfaces subparallel; dorsal surface slightly convex, less than twice as broad as long, separated from posterior surface by an obtuse margin; spines a little shorter than their distance apart at base, stout, arcuate.

Sublucid. Mandibles finely striate. Clypeus with fine oblique striae. Head, thorax, and epinotum with regular, slightly rugose striae, which are longitudinal except on sides of pronotum where they are oblique. Petiolar node finely striate. Gaster densely and rather coarsely and rugosely striate longitudinally. Legs and antennae finely punctate.

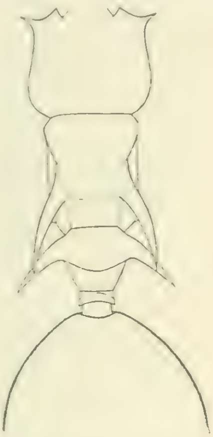


Fig. 47.— Polyrhachis (Hedomyrma) geminatus Mann. Worker. Thorax and petiole from above.

Erect hairs coarse, very sparse on head and apical portion of gaster. Head and body, with sparse, recumbent pubescence.

Black througbout.

Florida: Maliali.

Described from a unique worker.

The species is distinguished by the short, upturned, and bifurcate humeral spines, and the strong sculpture of the gaster.

110. POLYRHACHIS (HEDOMYRMA) ANNAE, sp. nov.

Worker. Length 4.5–5 mm.

Head distinctly longer than broad, evenly rounded behind, sides in front of eyes nearly straight, somewhat convergent. Clypeus evenly and moderately convex, the anterior border bidentate and shallowly concave at middle. Frontal carinae only slighty divergent, extending to opposite middle of eyes. Scapes surpassing occipital border by more than two thirds of their length.

Pronotum broader than long, broadest behind middle, margined at sides; humeral spines flat, acute at tips, divergent, and pointing slightly upward. Mesoëpinotum broadest in front, sides margined, converging to base of spines, surface between spines shallowly concave, in front nearly flat. Spines flattened and margined basally, slender apically and acute at tips, a little longer than their distance apart at base, moderately divergent and extending slightly upward. Petiole nearly flat, about the anterior border truncate; posterior border feebly rounded and slightly elevated and subgibbous at middle; spines slender, parallel with sides of gaster, slightly longer than their distance apart at base.

Moderately shining. Mandibles densely striate.

Head and pronotum densely rugulose-striate the latter more coarsely and with the striae more regular. Mesoëpinotum broadly and shallowly and reticulately striate, petiole and first gastric segment densely punctate.

Front and vertex with paired, erect setae. Head and pronotum with rather thin pubescence and mesoëpinotum, petiole, and first gastric segment with thicker very fine pubescence, silvery except on gaster where it is golden.

Black; appendages dark brownish red.

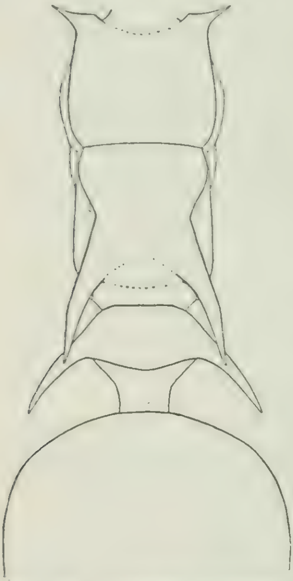


Fig. 48.— Polyrhachis (Hedomyrma) annae Mann. Worker. Thorax and petiole from above.

Santa Cruz: Graciosa Bay (Type-locality). San Cristoval: Pamua, Wainoni Bay. Three Sisters: Malapaina.

Described from workers in a colony that rested in earth among the suckers of an epiphyte and others taken on leaves and tree-trunks. *Type.*— M. C. Z. 9,193.

This species is common and widely distributed, but the colonies nest usually high in trees and are difficult to find.

111. Polyrhachis (Myrmothrinax) dahli Forel.

Mitt. Zool. mus. Berlin, 1901, 2, heft 1, p. 30, ☿.

San Cristoval: Wainoni Bay. Three Sisters: Malapaina. Malaita: Auki. Florida: Tulagi.

Rare, though evidently of wide distribution. The workers in a small series before me are a little smaller (length 6 mm.), but otherwise agree closely with Forel's description, based on Bismarck Archipelago specimens.

112. Polyrhachis (Myrma) salomo Forel.

Rev. Suisse zool., 1910, **18**, p. 87, ☿.

Malaita: Auki. Russell: West Bay, Yandina.

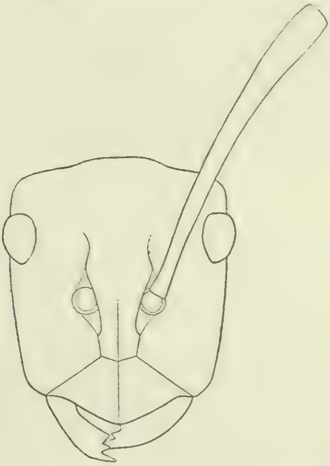


Fig. 49.— Polyrhachis (Myrma) salomo Forel. Worker. Front view of head.

Nests usually in crevices of logs of trees, and builds partitions and protecting walls of silk interwoven with vegetable material. One colony was found beneath a stone.

113. Polyrhachis (Myrma) similis Viehmeyer.

Abh. berichte K. zool. anthr.-ethn. mus. Dresden, 1912, **14**, no. 1, p. 8, ☿.

San Cristoval: Wai-ai, Pamua, Wainoni Bay, Star Harbor. Bio. Ugi: Pawa. Florida: Tulagi, Maliali. Ysabel: Fulakora. Russell: West Bay, Yandina. New Georgia. Rubiana Lagoon.

Probably the most conspicuous ant in the islands. Foraging workers were on nearly every tree examined. The colonies are in tree-cavities.

114a. POLYRHACHIS (Myrma) RELUCENS Latreille, subsp. ANDROMACHE F. Smith, var. NESIOTIS, var. nov.

Worker.

Differing from subsp. *andromache* in having the legs darker in color, dark red, with the femora in part and the tibiae infuscated and the tarsi black.

Santa Cruz: Graciosa Bay.

This variety, the only one of the *relucens* group found at Graciosa Bay is exceedingly abundant and very large series were obtained, all of which are constant in coloration. It nests in crevices of trees and in hollow fern-stalks. *Type.*— M. C. Z. 9,194.

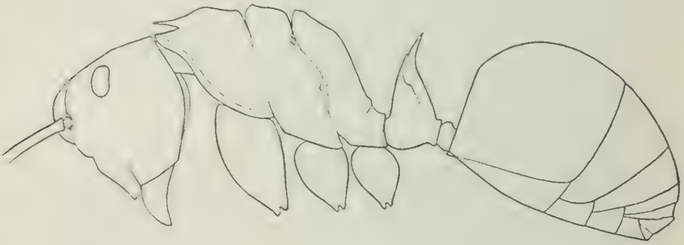


FIG. 50.— Polyrhachis (Myrma) relucens andromache nesiotis Mann. Worker.

114b. POLYRHACHIS (MYRMA) RELUCENS Latreille, subsp. LITIGIOSA Emery.

Ann. Mus. civ. stor. nat. Genova, 1897, **38**, p. 581, ☿.

Ysabel: Fulakora.

Numerous colonies were found nesting in rotten logs. Some of the cavities used as brood chambers were lined with silk.

Pinned specimens are very liable to grease and many among my series have the gaster black in appearance due to this, which hides the rich golden pubescence characteristic of the subspecies.

115. POLYRHACHIS (CHARYOMYRMA) RERE, sp. nov.

Worker. Length 3.5–4 mm.

Head a little longer than broad and somewhat narrowed in front, sides in front of eyes feebly convex, posterior border broadly rounded. Clypeus carinate, front lobed, the middle portion concave and obtusely dentate at sides. Front carinate at middle between frontal carinae. Frontal carinae widely separated, moderately elevated and little divergent behind. Eyes strongly convex, situated at posterior corners of head. Pronotum twice as broad as long, slightly convex, narrowly margined at sides; humeri with small triangular teeth that are a little longer than broad. Meso- and epinotum without suture, flat above, narrowly margined at sides. Base of epinotum very broadly rounding into the declivity. Epinotal spines a little longer than half their distance apart at base, slender, divergent, and nearly straight. Petiolar node with flat anterior and posterior surfaces, strongly narrowed and submargined above; seen from the front, the border is obtusely angulate at middle; spines short, rather stout, arcuate, and parallel with base of gaster.

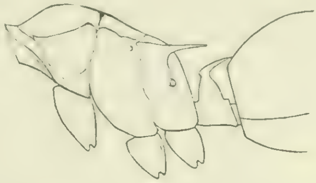


FIG. 51.— Polyrhachis (Charyomyrma) rere Mann. Worker. Lateral view of thorax and petiole.

Opaque, except gaster which is moderately shining. Mandibles with coarse, separated striae and, at apex, large punctures. Head densely striolate-rugose. Thorax and epinotum similarly but not as coarsely sculptured. Epinotal and petiolar spines and dorsal margin of petiole shining and rugose. Gaster, legs, and antennae densely punctate.

Fine, long, erect pile, abundant on head, body, and appendage, and rather long, appressed silvery pubescence on head and body, thick on gaster and sparser elsewhere.

Black throughout.

Guadalcanar: Rere.

116. Polyrhachis (Charyomyrma) kaipi, sp. nov.

Worker. Length 5 mm.

Head a little longer than broad, sides convex, posterior border broadly rounded. Mandibles with four large teeth. Clypeus carinate; anterior border lobed and concave at middle. Frontal carinae short, the anterior two thirds strongly laminate. Eyes moderately convex; situated at posterior thirds of sides. Pronotum twice as broad as long; disc feebly convex; sides and anterior border, except at middle, broadly lamellate, and moderately elevated, humeral spines triangular and acute. Promesonotal suture narrowly impressed. Mesonotum broader than long, broadest in front, sides lamellate and elevated similar to but not as broadly as on pronotum. Base of epinotum lower than mesonotum and distinct from it, though the suture is feebly impressed; surface flat, twice as broad as long, acutely margined at sides; broadly rounding into the flattened declivous portion which, in profile, is three times as long as base; spines about as long as their distance from base to promesonotal suture; thick basally and becoming slender apically, slightly curved downward, directed backward and moderately divergent. Petiole narrowly rounded above, the spine slender, about as long as those of epinotum and encircling base of gaster. Gaster short and ovate.

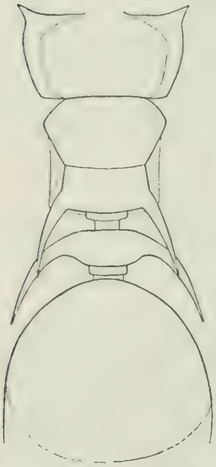


Fig. 62.—Polyrhachis (Charyomyrma) kaipi Mann. Worker. Thorax and petiole from above.

Strongly shining. Mandibles with regular, dense rather coarse striae. Clypeus with irregular, broad punctures, some of them confluent. Head striate, the striae strong and longitudinal on sides and cheeks, transversely arcuate above and obsolete on the median portion of vertex and occiput; striae of front finer and very irregular; vertex with coarse, piligerous punctures. Thorax and abdomen not striate, but with widely separated, foveolate punctures, similar to those on vertex. Epinotum and posterior surface of petiole with a thin mat of long, silky, semirecumbent hairs, and long, erect pile, the remainder with erect, very long, fine, and rather abundant pilosity, shortest on the head and appendages, but lacking the mat of shorter semirecumbent hairs.

Black; appendages dark reddish brown.

Pilosity yellowish.

Malaita: Auki.

Described from a unique worker.

This species is near *P. scutulatus* F. Smith, from Aru. It agrees with Smith's description except that the epinotum of *kaipi* is not opaque, but shining. Emery has described and figured (Rev. Suisse zool., 1893, **1**, p. 226, fig. 7–8) a New Guinea specimen that he considers *scutulatus*. In his figure of the head, the frontal carinae are broadly curved at sides, the thorax is distinctly broader than the head; the mesonotum is not distinctly separated from the epinotum and is more than twice as broad as long; in *kaipi* the frontal carinae are narrowly curved, the thorax is barely broader than the head and the mesonotum is less than twice as broad as long. The epinotal and petiolar spines of *kaipi*, as well as the humeral spines are very much longer than in *scutulatus*. *Polyrhachis aurita* Emery, also closely related, has the thorax proportionally very much broader, and is differently sculptured with the epinotal declivity and posterior surface of petiole striate, instead of smooth as in *kaipi*.

117. POLYRHACHIS (MYRMATOPA) ULYSSES Forel.

Rev. Suisse zool., 1910, **18**, p. 91, ☿.

Female. Length 10 mm.

Ocelli very small. Mesonotum convexly declivous at anterior third; posterior two thirds slightly convex and narrowly and very feebly margined at sides. Scutellum transversely oval. Prescutellum with weakly margined anterior border. Base of epinotum thinly margined at sides, the margins lacking the anterior angulate structure found in the worker, spines more slender than in the worker. Petiole similar to that of worker. Wings (length 9.5 mm.) clear, veins and pterostigma brown.

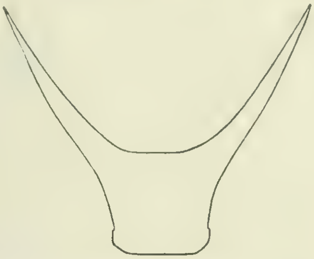


FIG. 53.— Polyrhachis (Myrmatopa) ulysses Forel. Petiole from front.

Florida: Tulagi, Maliali.

A handsome species, conspicuous because of the white tips to the antennae. It is much less common than the following related species.

118. Polyrhachis (Myrmatopa) osae, sp. nov.

Worker. Length 6.75–7.5 mm.

Head in structure very similar to that of *ulysses*. Pronotum convex; humeri with indistinct denticulae. Mesonotum margined at sides, the margins elevated into broad, subtriangular lobes; surface concave between lobes, behind declivous to the mesoëpinotal suture. Epinotum bluntly margined at sides; margins somewhat elevated, but not angulate in front, spines short and triangular; declivity sloping, much longer than base, with rather flat surface. Petiole as in *campbelli* but the spines shorter and less divergent (their distance at tips about equal to their length).

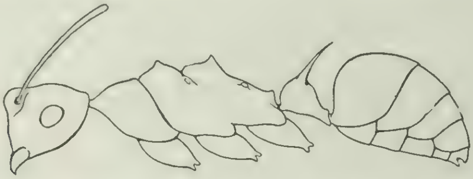


Fig. 54.— Polyrhachis (Myrmatopa) osae Mann. Worker.

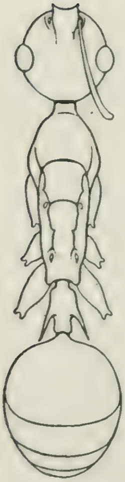


Fig. 55.— Polyrhachis (Myrmatopa) osae Mann. Worker.

Gaster very shining, the rest moderately shining except the head, which is nearly opaque. Mandibles punctate and striolate. Clypeus shallowly, cribrately punctate, except for a space near the base. Head rugulosely punctate. Thorax, epinotum, and petiole shallowly punctate and reticulate, the petiole more coarsely than the rest. Antennae and legs finely striolate, punctate.

Short, erect hairs present on funiculus and very fine and short appressed ones on clypeus and gaster and a pair of erect setae on sides of basal portion of clypeus.

Black. Mandibles and legs obscurely rufous last six joints of antennae pale yellow-brown.

Female. Length 8 mm.

Head as in worker. Ocelli small. Mesothorax slightly convex above; rounded at sides, with distinct parapsidal furrows. Scutellum a little broader than long, with nearly straight anterior border. Basal portion of epinotum roundly margined at apical half; spines as in worker. Petiole similar to that of worker.

Feebly shining, with sculpture as in worker.

Color as in worker. Wings weakly infuscated; veins and pterostigma brown.

Ugi: Pawa (Type-locality). San Cristoval: Wai-ai, Pamua, Wainoni Bay.

Closely related to *P. ulysses* Forel, but distinct in epinotal structure and in the form of the petiolar spines, which are not as long and are very much less divergent than in that species. The thorax is also much more shining in *osae* than in *ulysses*. *Type.*— M. C. Z. 9,191.

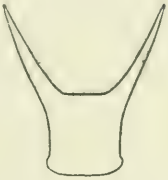


FIG. 56.— Polyrhachis (Myrmatopa) osae Mann. Worker. Petiole from front.

This species, which is named for Mrs. Osa Martin-Johnson, the first American woman to travel in the Solomons, is a characteristic species of the extreme eastern end of the group. The nests, built on leaves, usually on palm trees, are of *carton*, strengthened and lined, as well as fastened to the leaf by silk, and are very common objects in the forest. If a leaf bearing a nest is broken off and laid on the ground the ants rush out, but soon enter the nest again and will remain there, even though the nest be placed in a coat pocket and carried. I examined large numbers of nests of this, as well as other species of Polyrhachis, in search of inquilines, without finding any.

On several occasions I found two deälated females of *osae*, together with larvae, in very small nests, which indicates that the colonies are sometimes started jointly by more than one queen.

Nests are shown on Plates 1, 2.

119. POLYRHACHIS (DOLICHORHACHIS, subgen. nov.) MALAËNSIS, sp. nov.

Worker. Length 6.5–7.5 mm.

Head oval, longer than broad, rather narrowly rounded behind. Cheeks evenly convex. Mandibles 5-dentate. Clypeus distinctly carinate at middle; anterior border notched at middle and angulately toothed at either side of notch. Frontal carina narrow, moderately elevated, not divergent, extending to opposite middle of eyes. Antennae long and slender. Eyes small, convex, situated in front of side at posterior fourth of head. Thorax slender, flat above, sides strongly, angulately margined, but not laminate. Pronotum longer than broad, humeri with slender curved spines as long as their distance from base to promesonotal suture, directed forward and upward and moderately divergent. Promesonotal suture very distinctly, though narrowly impressed. Mesonotum longer than broad, narrowed behind; sides in front convex, behind concave. Mesoëpinotal suture indicated by a distinct transverse carina. Base of epinotum quadrate, longer than broad, with straight, sharply margined sides, concave between spines and evenly rounding into the declivity; declivity with convex surface, about as long as base. Spines long and very slender, extending backward and slightly upward and but little divergent. Petiolar node thick, anterior face in profile straight and forming a prominent blunt angle with the flat dorsal surface; posterior surface convex; spines very slender, longer than those of epinotum, moderately divergent, extending backward and upward and curved inward. Gaster broadly oval. Legs slender.

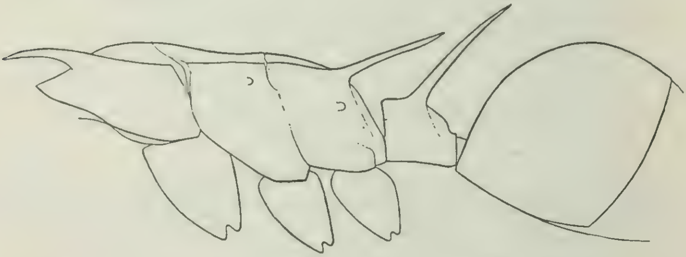


Fig. 57.— Polyrhachis (Dolichorhachis) malaënsis Mann. Worker. Lateral view of thorax and petiole.

Subopaque. Mandibles densely rugulose and striate apically. Clypeus and head rugulose striate, the striae dense, oblique on clypeus and longitudinal on head. Thorax, epinotum, and petiole striate similar to head. Gaster very finely and densely punctate and striate. Appendages finely and densely punctate.

Antennae and tibiae pollinose, head and body clothed densely with fine, short, silky, glistening silver pubescence.

Color black throughout.

Female (deälated). Length 9 mm.

Ocelli very small. Thorax and epinotum slender, but much shorter than in the worker. Otherwise similar to worker with the usual sexual modifications.

Malaita: Interior near Gwountafu.

Described from two workers and a female found in the ground near our camp fire, at an altitude of about 2,200 feet.

The elongate form and the arrangement of the spines are similar to *P. phyllophila* F. Smith and related Oriental species included in the subgenus Myrmhopla. However the margined thorax and epinotum do not permit including it in this subgenus and make the erection of Dolichorhachis necessary.

120. POLYRHACHIS (MYRMHOPLA) WHEELERI, sp. nov.

Worker. Length 6.–6.5 mm.

Head a little longer than broad, broadly rounded behind eyes; sides in front of eyes slightly convex. Mandibles 5-dentate. Clypeus obtusely, though distinctly carinate, with an anterior median lobe, separated from the rest by a moderately impressed transverse suture, and strongly bidentate. Frontal area indistinctly defined. Frontal carinae, short, extending to opposite middle of eyes, strongly and angulately elevated behind antennal insertions. Eyes strongly convex, situated at posterior third of sides. Antennae long, thorax robust. Pronotum slightly convex above, not margined, with long,

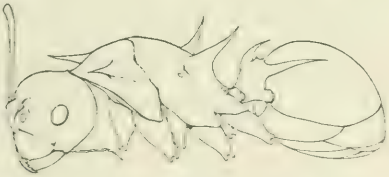


FIG. 58.—Polyrhachis (Myrmhopla) wheeleri Mann. Worker.

rather stout straight spines extending forward, upward, and outward. Promesonotal suture narrow. Mesoëpinotal impression very feeble. Base of epinotum twice as broad as long, slightly convex between the spines which are stout, about one and one half times as long as pronotal spines, moderately divergent, extending backward and upward and very feebly curved at apical half. Petiolar node in profile evenly convex in front, nearly straight behind; spines stout, strongly curved upward and backward, but not sufficiently divergent to encircle base of gaster, with two stout, triangular acuminate teeth between. Gaster very broadly oval.

Mandibles moderately shining, striolate, with elongate punctures; apically, with several fovolate punctures. Head, thorax, epinotum, and petiole opaque, coarsely and densely reticulately rugose; spines strongly striate and rugose. Gaster shining, finely and regularly punctate. Antennal scapes densely punctate. Legs transversely striolate.

Funiculus pollinose. Gaster with sparse, very fine, and short recumbent hairs. Other hairs absent except a few setae on front of head and clypeus.

Black; legs very dark ferruginous.

Malaita: Near Auki, on trail to Aisisiki. Ysabel; Fulakora.

One large colony was found in each locality. The Malaita nest was built on the under side of an agave leaf, mostly of silk but with a few strands of vegetable material through it, and resembled an inverted tent. The colony at Fulakora was in a triangular nest made of two leaves connected by a sheet of silk. Partitions of pure silk divided the interior into three chambers. *Type.*—M. C. Z. 9,188.

When I shook the bush on which this was situated the workers rushed out and grouped themselves on the top of the nest, standing with the thorax elevated, and the gaster shoved forward, and kept the antennae and the forelegs waving. They made an appreciable amount of noise when they rushed about, the nest serving as a sounding box.

This species resembles *armata* F. Smith in *habitus* but is a much smaller form, with shorter pronotal spines, finer thoracic sculpture and very shining gaster.

121. POLYRHACHIS (MYRMHOPLA) ARGENTEA Mayr.

Verh. K.K. zool.-bot. gesellsch. Wien, 1862, **12**, p. 682, ☿.

Malaita: Auki. Florida: Maliali.

I found *argentea* only on two occasions. A small colony at Auki was in a nest made of two leaves fastened together with silk, similar to the one described by Wroughton (Journ. Bombay nat. hist. soc., 1892, 7, p. 37).

My specimens agree perfectly with Mayr's description and with workers from the Philippines.

122a. POLYRHACHIS (CYRTOMYRMA) RASTELLATA (Latreille), var. FULAKORA, var. nov.

Worker. Length 6.5 mm.

A very large series of workers from many colonies agree with *rastellata* in structure, having the pronotum broadest in front and with rounded humeri, the epinotum entirely without spines and the lateral spines of the petiole well-developed and acute, but differ in the color of the legs, which are very dark reddish brown, instead of blood-red. This difference is constant throughout the series and warrants this variety.

Ysabel: Fulakora.

Stitz (Sitzungsb. Gesellsch. nat. freunde Berlin, 1911, p. 381) describes *rastellata* var. *major* as larger than the typical form and with dark brown legs. He does not give the length. The humeri of his variety are more angular than in *rastellata*. In var. *fulakora* they are rounded as in the type form. The epinotum in *fulakora* is more convex in profile rather similar to subsp. *euryala* F. Smith from Java as figured by Viehmeyer (Archiv naturg., 1913, p. 52). *Type.*—M. C. Z. 9,189.

122b. POLYRHACHIS (CYRTOMYRMA) RASTELLATA Latreille, subsp. UGIENSIS, subsp. nov.

Worker. Length 5.5–6 mm.

The specimens from the eastern Solomons represent still another form of this variable species, characterized by the shorter spines of the petiole, which in some specimens have the lateral ones reduced to mere angles, and in the color of the legs. The femora and the tibiae are reddish brown, with the bases of the latter and the tarsi black. The antennae are black, except the extreme tip of the last segment, which is brown.

Nests are figured on Plate 2, fig. 1, 2.

Ugi: Pawa. San Cristoval: Wai-ai, Pamua, Wainoni Bay. Three Sisters: Malapaina.

The different forms of *rastellata* build nests of vegetable fibres interwoven with silk, selecting as a site the tip of a leaf, usually that of a palm. The sides of the leaf are drawn somewhat together and fastened with silk form a partial and sometimes an entire covering of the nest. *Type.*— M. C. Z. 9,190.

122c. POLYRHACHIS (CYRATOMYRMA) RASTELLATA Latreille, var. JOHNSONI, var. nov.

Worker. Length 7 mm.

Resembling *laevior* var. *debilis* Emery in having on the epinotum a pair of distinct though very short and small spines. It is much larger in size than *debilis* and the legs are uniformly dark brown, almost black.

The thorax is evenly arched, much as in *leonidas* Forel and the epinotal declivity in profile is straight.

Rendova.

One colony was found, in a silk and *carton* nest on a palm leaf. *Type.*— M. C. Z. 9,195.

123. POLYRHACHIS (CYRTOMYRMA) EMERYANA, sp. nov.

Worker. Length 5 mm.

Head a little broader than long, broadly rounded behind and rather strongly narrowed in front. Clypeus only moderately convex, shallowly concave at middle of anterior border. Frontal carinae little divergent, extending to opposite middle of eyes, in profile elevated and evenly rounded in front. Antennal scapes surpassing occipital corners by about five eighths of their length. Pronotum broader than long, strongly convex above. Mesoëpinotum

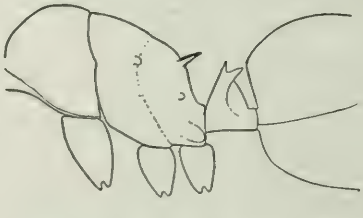


FIG. 59.— Polyrhachis (Cyrtomyrma) emeryana Mann. Worker. Lateral view of thorax and petiole.

little convex, the suture indicated by a very shallow and indistinct impression; subangulate between base and declivity. Epinotal spines nearly straight, a little shorter than their distance apart at base. Petiolar node subtriangular in profile, the dorsal edge margined and bearing four spines, the inner pair of which are triangular, as broad basally as long, and the outer elongate-triangular, acute apically and four times as long as the inner pair.

Moderately shining. Finely coriaceous and with minute punctation.

Very fine and short recumbent pubescence thinly distributed on head, body, and appendages.

Color black.

Malaita: Auki.

Described from a unique worker.

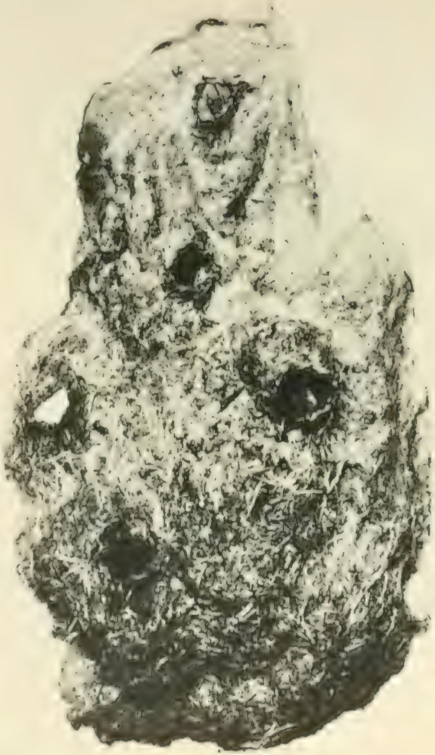
This species is near *leonidas* Forel, but is distinctly smaller, the mesoëpinotum is much less convex, the spines smaller and more cylindrical and the outer pair of petiolar spines very much longer in proportion to the inner pair than in a cotype of *leonidas* in Professor Wheeler's collection.

EXPLANATION OF THE PLATES.

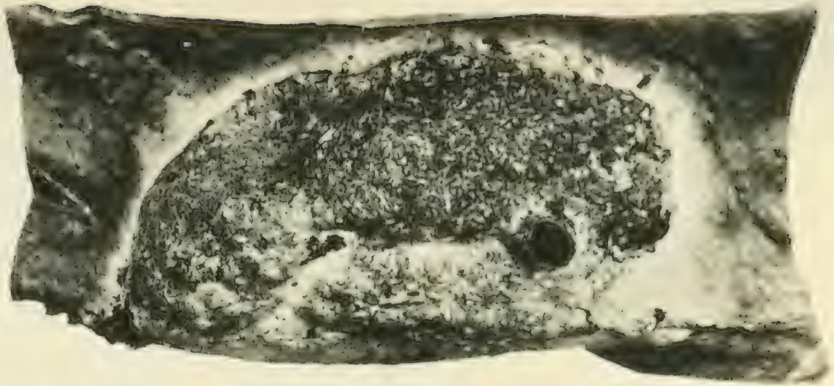
PLATE 1.

PLATE 1.

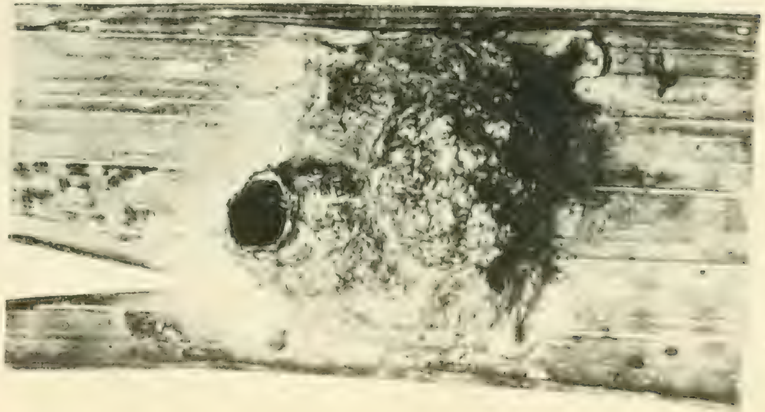
Fig. 1–3.— Nests of *Polyrhachis* (*Myrmatopa*) *osae* Mann. 1½ × nat. size.
Photographs by John Howard Paine.



1



2



3

PLATE 2.

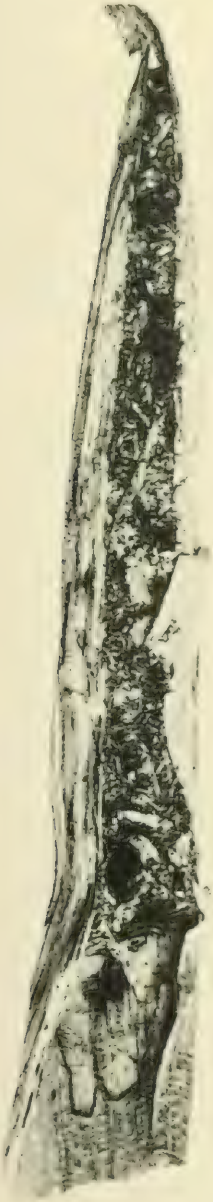
PLATE 2.

Fig. 1.—Nest of *Polyrhachis* (*Cyrtomyrma*) *rastellata* (Latreille), subsp. *ugiensis* Mann on leaf of a palm. 1½ × nat. size.

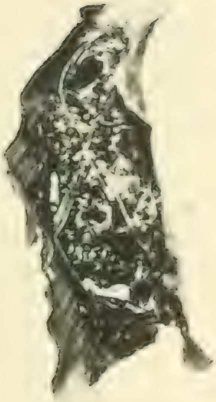
Fig. 2.— Incipient nest of the same. 1½ × nat. size.

Fig. 3.— Incipient nest of *Polyrhachis* (*Myrmatopa*) *osae* Mann. 1½ × nat. size.

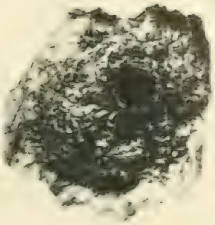
Photographs by John Howard Paine.



1



2



3

Bulletin of the Museum of Comparative Zoölogy
AT HARVARD COLLEGE.
Vol. LXIII. No. 8.

SOME AMPHIBIANS FROM NORTHWESTERN PERU, WITH A REVISION OF THE GENERA PHYLLOBATES AND TELMATOBIUS.

By Thomas Barbour and G. K. Noble.

With Three Plates.

CAMBRIDGE, MASS., U. S. A.
PRINTED FOR THE MUSEUM.
January, 1920.

No. 8.— *Some Amphibians from Northwestern Peru, with a Revision of the Genera Phyllobates and Telmatobius.*

By Thomas Barbour and G. K. Noble.

During the summer and autumn of 1916 the junior author served as zoölogist of an expedition to northwestern Peru undertaken in the interests of the School of Tropical Medicine (Harvard University) and the Museum.

This paper is the first of a series dealing with the herpetological collections secured. It is our intention to make these papers more than faunal lists and though it was expected that the deserts of northern Peru would yield few amphibians and that the number of species would be small, the percentage of new forms proves extraordinarily large. Notes on the habits of the species observed, especially of the new marsupial frogs will be included in a later paper.

The expedition crossed the provinces of Piura, Cajamarca, and Lambayeque. The towns of Huancabamba and Palambla are on the western range of the Andes, on the border of Piura. This northern Huancabamba should not be confused with the town of the same name of central Peru near Oxapampa. From the latter several reptiles and amphibians were collected by Enrique Boettger in 1910 and described by Boulenger. Not one of these species was found in the Huancabamba visited. This caused some confusion and after correspondence with Dr. Boulenger and Mr. W. F. H. Rosenberg, it is apparent that Boettger's material should be labeled Oxapampa, his Huancabamba being far less widely known than the much larger town of the same name. The species affected are:—*Anolis boettgeri*, *Stenocercus boettgeri*, *Prionodactylus spinalis* (Ann. mag. nat. hist., 1911, ser. 8, **7**, p. 19–24); *Hyla melanopleura*, *Edalorhina nasuta* (*Loc. cit.*, 1912, ser. 8, **12**, p. 185–190); *Leptognathus polylepis*, *Lachesis chloromelas* (*Loc. cit.*, 1912, ser. 8, **10**, p. 422–424); and *Hylella ocellata* (*Loc. cit.*, 1918, ser. 9, **2**, p. 433). Tabacónas lies in a little valley between the ranges of the cordillera in the northern part of Cajamarca and is in the only strip of rain forest met with during the expedition. Perico, Bellavista, and Chumayo are in the same province in the low, broad and arid valleys of the Chinchipe and Marañon Rivers. Querocotilla is on the border line between Cajamarca and Lambayeque. Like Huancabamba it is a mountain town on the western range of the Andes.

In the preparation of this paper we are greatly indebted, especially in our study of the genera Phyllobates and Telmatobius, to Dr. Leonhard Stejneger for the loan of a number of specimens; to Mr. H. W. Fowler for a similar loan of Cope's types of *Telmatobius angustipes, T. pustulosus,* and *T. aemaricus;* to Dr. G. A. Boulenger for his unpublished notes on *Phyllobates pratti* and to Dr. Louis Roule for a sketch of the pectoral girdle of *P. bicolor.*

RANIDAE.

PHYLLOBATES SYLVATICA, sp. nov.

Diagnosis. Closely related to *P. latinasus* (Cope) from which it may be distinguished by the following characters: —

Tympanum about one third instead of one half the diameter of the eye. First finger a trifle shorter instead of a little longer than the second. Tibiotarsal articulation reaching to the middle of the eye, the anterior corner of the eye, or slightly beyond instead of barely reaching the eye. Upper lip broadly edged with white, posterior face of femur black reticulated with white, chest and throat of young specimens washed with grey which may persist in the adult; — instead of upper lip narrowly edged with white, posterior face of femur divided by a yellow line, ventral surface immaculate in both young and adult.

Range. The wet, forested subtropical highlands ("montaña") from Tabacónas to Charápe in northwestern Peru.

Type. M. C. Z. 5,344 from stream-bed at Tabacónas (near Huancabamba) northwestern Peru; 1 September, 1916, G. K. Noble.

Description of Type. Snout moderately prominent, as long as the diameter of the orbit; loreal region vertical; nostril nearer the tip of the snout than the eye; interorbital space a little broader than upper eyelid; tympanum half concealed by a glandular fold, about one third the diameter of the eye; discs well developed, smaller than tympanum; two small metatarsal tubercles, inner oval, outer rounded; a small oblique ridge in the middle of the inner side of the tarsus; tibiotarsal articulation reaching to the middle of the eye. Skin smooth, glandular on the sides.

Uniform dark brown above; a black stripe extending entirely around the body; the upper edge of this stripe, in the body region, bordered with yellow and the lower edge reticulated with white. Upper lip and lower part of the face, from a line connecting the nostril and tympanum, fleshy white; limbs pale brown blotched with dark brown; hinder sides of thighs reticulated with white; lower parts and ventral surface of body pinkish white, immaculate.

Dimensions.

Distance from snout to vent	33 mm.
Greatest width of head	11 "
Distance from axilla to tip of longest digit	19 "
Distance from groin to tip of longest toe	46 "

Notes on Paratypes. The twelve other specimens of the series range in size from fifteen to thirty-two millimeters (snout to vent). One specimen still possesses a large part of the tail. The small specimens are very different in coloration from the adult. Instead of the ventral surface being immaculate there is present a heavy wash of grey extending completely over the throat, chest, and anterior part of the abdomen. In most of the small specimens this grey wash is finely spotted with white. The young of *P. latinasus* do not have the grey wash. At least they are not so recorded. One specimen (M. C. Z. 2,899) of *P. latinasus* from Chimbo, Ecuador is of nearly the same size as two of our small specimens and yet there is no trace of the grey wash. In two of the large paratypes of *P. sylvatica*, both males, this wash is present but only faintly indicated, while it is entirely absent in all of the adult females.

There are only two adult males in the collection. These differ from all the other specimens in being weakly tubercular above. Apparently in this species as in *Bufo marinus* — to a greater extent — rugosity is a secondary sexual character. It has been shown that the males of certain other species of Phyllobates transport the larvae on their back. Two tadpoles of this species were taken in a small pond. These do not differ materially except in size from the tadpoles of the tadpole-carrying-species, *P. subpunctatus* (*cf.* Ruthven and Gaige, Occas. papers, Univ. Mich., 1915, no. 10). Still in the two tadpoles of *P. sylvatica* the second row of teeth is divided by a much shorter interspace than in the tadpoles of *P. subpunctatus*. If the male of *P. sylvatica* does carry its larvae, it is possible that the rugosity may help the tadpoles to maintain their hold.

Besides the presence or absence of the ventral wash of grey, there are other variations in the adults. The dorsal surface may be brown, spotted with black. In that case the lateral yellowish stripe is very wide, and the dark cross-bars on the thighs are in sharp contrast to the greyish ground-tones. Most of the adults have some dark spots on the back, and most have the dark lateral band profusely reticulated with white.

Phyllobates infraguttatus Boulenger.

Nearly a thousand specimens from several localities: — Palambla and Huancabamba (August), Perico and Bellavista (September), and Querocotilla (October).

We have not been able to find any character with which to distinguish the specimens from Palambla, Huancabamba and Querocotilla from a specimen (M. C. Z. 3,214) of *P. infraguttatus* taken at Rio Chanchan, Ecuador. The majority of our specimens from the mountains of northern Peru are dark grey below spotted with white, similar to the Ecuadorian specimen of *P. infraguttatus* before us, but a few of those from the mountains and all of those from the lowlands (Perico and Bellavista) have the ventral surfaces white with a pair of large dark spots just anterior to the pectoral girdle and sometimes a delicate marbling of the same tone along the sides of the belly. The pair of dark spots is scarcely visible in the dark bellied specimens from the mountains and no such spots are mentioned in Boulenger's description of *P. infraguttaius*. Nevertheless they are apparently invariably present in some degree and form the most important distinguishing character of the species.

Peracca (Boll. Mus. Torino, 1904, **19**, no. 465, p. 17) has shown that Phyllodromus must be referred to Prostherapis, a genus indistinguishable from Phyllobates as defined by Boulenger (Proc. Zool. soc. London, 1888, p. 206). The notch on the posterior margin of the tongue is extremely variable in all the species of Phyllobates and Prostherapis which we have examined. In *Phyllobates trinitatus* the tongue is often entire, while in our huge series of *P. infraguttatus* the tongue is sometimes emarginate and sometimes entire. In the four specimens of *P. latinasus* before us the notch shows various degrees of development. We have examined specimens of *Prostherapis inguinalis* and *P. boulengeri* having an emarginate tongue. It is evident then that the emarginate tongue does not distinguish Phyllobates from Prostherapis.

In internal structure Prostherapis agrees essentially with Phyllobates. The type of the latter genus, *P. bicolor,*[1] is known only from the type-specimen. This is at present in the Museum d'Histoire Naturelle in Paris, and thanks to the kindness of Dr. Louis Roule we are able to make some statement as to its internal structure. Its pectoral girdle is similar to that of *Phyllobates trinitatus*, *P. pratti*, *P. infraguttatus*, *Prostherapis inguinalis*, and *P. boulengeri*. The girdle-form of *P. trinitatus* Garman (Fig. 1) may be taken as characteristic of all these species. In the sketch of the girdle of *P. bicolor* sent us by Dr. Roule, the anterior part of the omosternum is not represented. It may have been lost during dissection. The fact that the form of the coracoids and metasternum agrees in all the species examined is excellent indication of the species close affinity. We can see no reason for maintaining Prostherapis distinct from Phyllobates.

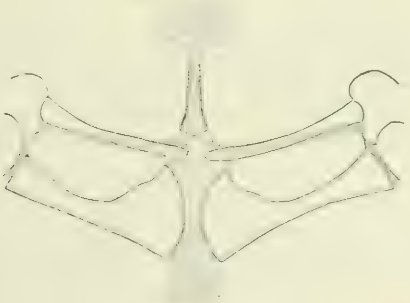


FIG. 1.— Phyllobates trinitatus Garman. Shoulder-girdle. x 18.

There remains another genus which should be referred to the synonymy of Phyllobates. Colostethus, known only from the type-specimen of *C. latinasus*, was described by Cope as lacking the omosternum. The type-specimen cannot be found in either the U. S. National Museum or the Academy of Natural Sciences of Philadelphia. Specimens very similar to *C. latinasus*, but possessing an omosternum, have been found in Ecuador and Colombia. Boulenger has recently advised the senior author by letter that he considers his *Phyllobates pratti* referable to *C. latinasus*. Boulenger evidently considers that Cope overlooked the omosternum, a very probable oversight, in view of the smallness of the type-specimen. Since the type of *C. latinasus* is most probably lost, we consider it advisable to follow Boulenger's suggestion and to place Colostethus in the synonymy of Phyllobates.

---

[1] The locality of this species has been discussed by the senior author (Mem. M. C. Z., 1919, **47**, p. 113).

The number of species of Phyllobates is greatly increased by the referring of Phyllodromus, Prostherapis, and Colostethus to its synonymy. It is highly probable that some of the species are not actually distinct from others. The name *P. pulchellus* is based upon a figure only (Espada, Vertebrados del Viaje al Pacifico, Batracios, 1875, pl. 3, fig. 3, 3a, 3b, and 3c) of a frog, without data. Unfortunately the figures do not show the ventral surface. Seven species of Phyllobates are described with a dorsal pattern very similar to that represented as *P. pulchellus*. These seven species are most readily distinguishable by their ventral coloration. Any one of them may be referable to *P. pulchellus* but without a description of their ventral surfaces it is impossible to say which of them should bear the name. Our specimens of *P. infraguttatus* are very similar to Espada's figure. Moreover, we have recently examined some specimens (U. S. N. M. 61,763, 61,764) of the same species from Huigra, Ecuador. These offer further evidence of the wide distribution of the species in Ecuador and northern Peru. It is probable that Espada's type of *P. pulchellus* came from Ecuador. But until this type-specimen can be examined and sufficiently characterized we have no right to refer Boulenger's *P. infraguttatus* to that species. The name *P. pulchellus* must be dropped until the type-specimen can be examined.

We have remarked about the similarity of color-pattern in several species of Phyllobates. The dorsal color-pattern shows little variation in our enormous series of *P. infraguttatus*. The ground-tone may be light or dark grey. The pale specimens, mostly from the lowlands, have the dorsal spotting very distinct and in sharp contrast to the light grey ground-tone. Dark specimens are uniform above, the spots being concealed by the ground-tone. The characteristic pair of spots on the chest are indistinct in the darkest and practically wanting in the very lightest specimens of the series.

At Querocotilla one specimen was found which appeared nearly a uniform pea-green. The specimen was put in a jar of fixing fluid (.5% formol) and in the course of half an hour the green tones were replaced by greys and the ordinary pattern appeared making the specimen indistinguishable from the others.

The species of Phyllobates are all small, and possess few features by which they may be distinguished from one another. Still it has been considered advisable to attempt a key, unfortunately based largely upon the published descriptions. In the preparation of this key certain species have been found to be certainly synonymous with others. *Prostherapis equatorialis* Barbour is referable to *Eleutherodactylus unistrigatus* (Günther), *Prostherapis herminae* Boettger to *Phyllobates trinitatus* Garman, *Prostherapis variabilis* Werner to *Phyllobates subpunctatus* Cope, and *Phyllobates* (*Hypodictyon*) *palmatus* Werner to *Syrrhophus palmatus* Werner.

Key.

A. Flash colors of red or yellow on the axilla and inguinal or femoral regions; dorsal surface of head and body distinctly glandular.

B. First finger longer than second.

C. Flash colors yellow .... *femoralis* (Boulenger).

CC. Flash colors pink .... *inguinalis* (Cope).

BB. First finger not extending beyond second.

C. Ground-tone of back lemon-yellow .... *tricolor* (Boulenger).

CC. Ground-tone of back brownish grey .... *festae* (Peracca).

AA. No flash colors; dorsal surface of head and body not distinctly glandular although sometimes tubercular.

B. Lower surfaces of adult white, immaculate.

C. Tibiotarsal articulation not reaching beyond tympanum. *vertebralis* (Boulenger).

CC. Tibiotarsal articulation reaching to eye.

D. Skin with numerous low, glandular warts, tympanum concealed. *brunneus* (Cope).

DD. Skin smooth or with scattered tubercles, tympanum indistinct.

E. Tympanum one half diameter of eye; tibiotarsal articulation reaching barely to eye .... *latinasus* (Cope).

EE. Tympanum one third diameter of eye; tibiotarsal articulation reaching to middle of eye or beyond. *sylvatica* Barbour & Noble.

BB. Ventral surface of adult brown or spotted with dark tones.

C. A dark bar, two dark spots or a dark wash spotted with white on the chest.

D. A dark bar across the chest, anterior part of belly generally of same dark tone .... *trinitatus* Garman.

DD. No dark bar across chest.

E. Throat and breast mottled with greyish brown. *kingsburyi* Boulenger.

EE. Ventral surface dark, spotted with white, sometimes only two greyish spots on chest.

F. Black above, spotted with white on sides. *alboguttatus* Boulenger.

FF. Greyish above, no spots on sides, generally a longitudinal stripe on each side. . . . . *infraguttatus* Boulenger.

CC. No dark bar or spots on chest.

D. Ground-tone of ventral surface uniform blackish. *melanorhinus* Berthold.

DD. Ground-tone of ventral surface greyish or whitish.

E. Tympanum concealed, throat greyish, belly white. *trilineatus* Boulenger.

EE. Tympanum not concealed.

F. Tympanum two thirds diameter of eye.

G. Two white lines on each side of head. *bolivianus* (Boulenger).

GG. No white lines on head. . . . . *whymperi* (Boulenger).

FF. Tympanum about half the diameter of eye, or less, sometimes indistinct.

G. First finger longer than second; tympanum hidden or about one third diameter of eye. . . . *boulengeri* (Barbour).

GG. First two fingers of equal length; tympanum about half as broad as eye. . . . . *subpunctatus* (Cope).

One species, generally referred to Phyllobates, differs radically from all the species of that genus and must be considered generically distinct. We propose for it the name:

SMINTHILLUS, gen. nov.

Type. *Sminthillus limbatus* (Cope).

Diagnosis. Habit of Phyllobates but no pair of dermal scales on the upper surface of the digital discs; coracoids narrow (Fig. 2); precoracoid cartilages very broad, merging gradually into the broad epicoracoid cartilage; omosternum cartilaginous, without a bony

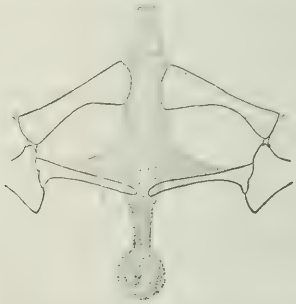


FIG. 2.— Sminthillus limbatus (Cope). Shoulder-girdle. x 27.

sheath in the adult; sacral diapophysis slightly dilated; no vomerine teeth; tongue elliptic, narrow and free behind; pupil horizontal; tympanum distinct; toes free; terminal phalanges T-shaped.

LEPTODACTYLIDAE.

ELEUTHERODACTYLUS LYMANI,[1] sp. nov.

Diagnosis. Similar to *E. conspicillatus* (Günther) in most of its features, but differing from that species in the much shorter toes, especially the fourth toe; in the longer first finger and in the somewhat different color-pattern. Young specimens are similar in habit to that species but adult specimens are much stouter and with a broader, less acuminate snout.

Range. Hills and valleys of the central Andes of northwestern Peru, from Palambla (near Huancabamba) to Bellavista.

Type. M. C. Z. 5,422 from Perico, valley of the Chinchipe, northwestern Peru; 10 September, 1916, G. K. Noble.

Description of Type. Size large, head broader than body, exactly as long as broad; snout subacuminate with distinct *canthus rostralis* and concave loreal region; orbital diameter equals the distance between the eye and nostril, twice as great as the distance from nostril to end of snout; interorbital space a trifle broader than the upper eyelid. Tongue oval, slightly nicked behind. Vomerine teeth in two oblique, approximated fasciculi behind the choanae. Tympanum distinct, half the diameter of the eye. Fingers moderate, the first extending beyond the second; toes short with a rudiment of a web; discs small, not much wider than the middle part of the toes; subarticular tubercles well developed; a round outer and an elongate inner metatarsal tubercle, both very distinct. Tibiotarsal articulation reaches just to the tip of the snout. Skin finely granular on the back, nearly smooth on the head, and coarsely granular on the lower surfaces of the thighs; no glandular dorsolateral fold.

Ground-color above, ashy grey fading to yellowish grey on the sides. Two chevron-shaped bands of dark brown on the back, one over the scapulae and one just before the ilia; two or three spots of the same color posterior to the ilia. A narrow stripe of dark brown along the *canthus rostralis* and over the tympanum; a faint interorbital bar. Lips and appendages cross-barred with dark brown; four bars across the legs; posterior surfaces of thigh reticulated with dark brown and white. Ventral surface of head and body white, unspotted; of feet a dark brown.

---

[1] Named in honor of Prof. Theodore Lyman whose generosity enabled the Museum of Comparative Zoölogy to send a zoölogist with the Harvard Peruvian expedition of 1916.

Dimensions.

Distance from snout to vent	52 mm.
Greatest width of head	21 "
Distance from axilla to tip of longest finger	29 "
Distance from groin to tip of largest toe	89 "

Notes on Paratypes. The twenty-nine specimens in the series show considerable diversity in color. The ground-tone varies from a yellow or a dull pink to a very dark brown. The specimens vary in length from 23 to 58 millimeters (snout to vent). Most of the small specimens have a very distinct pattern with a dark interorbital bar and two spots anterior to it. Two small specimens have a light vertebral line. The pattern does not appear in a few of the specimens. Very dark specimens have the throat stippled with brown.

ELEUTHERODACTYLUS CAJAMARCENSIS, sp. nov.

Diagnosis. Related to the Borborocoetes group of Eleutherodactylus, *e. g. E. whymperi, E. unistrigatus* etc.; probably most closely related to *E. riveti* (Despax); distinguished from the latter species by the following characters: — tympanum distinct slightly less than half the diameter of the eye; first toe shorter than the second; skin smooth on the snout, slightly granular on the eyelids and back, the granules tending to form a series of longitudinal rows; coloration nearly uniform yellowish grey; a few dark lines forming a weak pattern; ventral surface immaculate.

Range. Only known from the type-specimen.

Type. Sexually mature male, M. C. Z. 5,407 from the Pre-Incan ruins near Huambos, Cajamarca, northwestern Peru; 10 October, 1916, G. K. Noble.

Description of Type. Size small, body depressed; head broad, Hyla-like; head about as broad as the body; broader than long; snout blunt with very distinct *canthus rostralis;* orbital diameter much greater than the distance between eye and the nostril; the latter situated very near the end of the snout; interorbital space a little broader than upper eyelid. Vomerine teeth barely distinct, in two obliquely directed groups, extending backward from the inner, posterior margins of the choanae. Tympanum distinct, slightly less than half the diameter of the eye. Fingers stout, the second extending beyond the first; toes short, a vestige of a web between the outer three; discs distinct, those of the toes larger than those of the fingers; subarticular tubercles well developed, a round outer and a very elongate inner metatarsal tubercle, both very distinct. Tibiotarsal articulation reaching only to the tympanum. Skin smooth on the snout, slightly granular on the eyelids and back, the granules on the back tending to form a series of indistinct longitudinal rows; sides of the body warty; ventral surface strongly granular.

Coloration in alcohol nearly uniform yellowish grey; a dark canthal stripe fading out behind the tympanum; a number of indistinct brownish bands extending along the back; three oblique bands across the legs, these tending to form continuous lines when the leg is half extended; ventral surface uniform yellowish grey, much yellower than the dorsal surface. In life the ground-tone was yellowish pink and the dark pattern was fairly distinct.

Dimensions.

Distance from snout to vent	19	mm.
Greatest width of head	7.5	"
Distance from axilla to tip of longest digit	12	"
Distance from groin to tip of longest toe	26.5	"

LEPTODACTYLUS CURTUS, sp. nov.

Diagnosis. A short-legged species having no fringes on the toes, apparently related to *L. bufonius* Boulenger; head short, the profile chisel-shaped; tympanum half the diameter of the eye; no distinct dorsolateral fold; back and sides with a few low warts.

Range. Valleys of the Chinchipe and Marañon Rivers between Perico and Bellavista, northwestern Peru.

Type. M. C. Z. 5,281 from Bellavista, Cajamarca, Peru; 28 September, 1916, G. K. Noble.

Description of Type. Size moderate; head about as wide as the body, just as long as broad; snout very accuminate without *canthus rostralis,* but with a slight depression in the loreal region; profile of snout a very acute angle, the anterior corner of the eye, the nostril and the tip of the snout being in the same plane; orbital diameter slightly greater than the distance between eye and nostril, slightly less than the distance between nostril and end of the snout; interorbital space about one half as broad as the upper eyelid. Tongue oval, slightly nicked behind. Vomerine teeth in two well-arched series behind the choanae. Tympanum one half the diameter of the orbit. First finger much longer than the second; toes short, not fringed; subarticular tubercles well developed; the inner metatarsal tubercle very large, the outer barely visible;

a distinct tarsal fold. Tibiotarsal articulation reaches to the tympanum. Skin glandular but not tubercular; a few flat warts on the back and sides; these tend to form a weak dorsolateral fold; a large ovoid gland situated at each corner of the mouth, its posterior end directed downward; a large inguinal gland on each side of the body; a small but distinct glandular wart on the posterior face of each femur.

Ground-tone of dorsal surface olive-grey; a number of dark brown spots forming a pattern; an hour-glass-shaped figure between the eyes and pectoral region; the anterior end of the figure much wider than the posterior, and outlined with pale grey; the posterior end of the figure continuous with two rows of dark spots which extend the length of the back; a series of dark spots along the side of the head and body; these tend to form a line along the indistinct dorsolateral fold; two or three spots on the lips; the legs irregularly cross-barred; the posterior surfaces of the thighs reticulated with black and white; ventral surface whitish, immaculate.

Dimensions.

Distance from snout to vent	49	mm.
Greatest width of the head	19	"
Distance from axilla to tip of longest digit	26	"
Distance from groin to tip of longest toe	66	"

Notes on Paratypes. The series of twenty-two specimens shows a great uniformity in the proportions of the body. The color-pattern is subject to some variation. This consists chiefly in a multiplication of the dark spots, and in a fading or intensifying of the ground-tone. Very dark specimens have the periphery of the ventral surface stippled with dark brown.

Remarks. A study of a series of *Leptodactylus albilabris* from St. Croix has led to the conclusion that the chisel-shaped head form of *L. curtus* may be only a somatic variation. All of the specimens in our series of the latter species (these measuring in length, snout to vent, from forty to fifty-eight millimeters) have exactly the same head-form regardless of sex. It has been suggested (Barbour, Proc. Biol. soc. Wash., 1917, **30**, p. 103) that this head-form might be a nuptial modification; it does not seem that it is a secondary sexual character, at least not in the case of *L. curtus*. In our specimens even the youngest are hardly sexually mature. Since these were all taken around sandy sloughs, it is possible that the head-form may be a modification for burrowing in the sand. Direct field observation is lacking on this point.

TELMATOBIUS Wiegmann.

The status of the genus Telmatobius has not been understood. Its true relations cannot be determined until the internal structure of the type, *T. peruvianus,* has been described and the statements of Cope (Bull. 34, U. S. N. M., 1889, p. 312) confirmed. For the present we refer his genus Cophaeus to the synonymy of Telmatobius.

Telmatobius has been confused also with Cycloramphus. Specimens of that genus are not available for study but judging from the published descriptions the genus is a well-defined one. It is distinguished from Telmatobius by the presence of stout vomerine teeth arranged in two long rows behind, not between, the choanae. Inguinal glands are present in three of the four described species but are not mentioned in *C. brasiliensis* (Steindachner). In Telmatobius not a single species is so provided. The males of the latter genus, unlike the former, are provided during the breeding season with dense asperities on the chest, forearm, and thumb. Boulenger (Cat. Batr. Sal. Brit. mus., 1882, p. 184) distinguishes Cycloramphus from Telmatobius by its separated outer metatarsals. This character is not mentioned in several of the descriptions, and until specimens can be examined it seems advisable to use the teeth characters as distinguishing Cycloramphus from Telmatobius. In doing this we find that we have two natural assemblages, Telmatobius confined to the Andes and Bolivian Chaco and Cycloramphus to the highlands of Brazil. After referring *Telmatobius brasiliensis* Steindachner and *T. duseni* Andersson to Cycloramphus, and upon placing *T. asper* Boulenger in the synonymy of *C. asper* Werner we have four species of Cycloramphus which may be separated by the following

Key.

A. Toes less than half webbed .... *duseni* (Andersson).
AA. Toes more than half webbed.
  B. Skin smooth .... *fuliginosus* Tschudi.
  BB. Skin warty or provided with horny tubercles.
    C. Skin of the body loose and wrinkled; toes completely webbed. *brasiliensis* (Steindachner).
    CC. Skin of body not loose dorsally; toes not fully webbed. *asper* Werner.

The species of Telmatobius are so little known that it is advisable to redescribe the type-specimens of several of the species and to append a key of all those considered distinct. In reviewing the species the fact has presented itself very forcibly that Telmatobius within itself represents various stages in the reduction of both maxillary and vomerine teeth. This reduction of teeth is associated with aquatic life. In the Lake Titicaca region *T. aemaricus* is found along the edges of the small streams and ponds, while *T. culeus* occurs only in the deep waters of Lake Titicaca where according to Garman (Bull. M. C. Z., 1875, **3**, p. 277) it is able to remain for hours without coming up to breathe. Garman (*Loc. cit.*) says "As might be expected from the exclusively aquatic habits of culeus, its skeleton is weaker and less perfectly ossified than that of marmoratus [= our *aemaricus*]. In the latter the skull and its processes are strong and the foramina and fontanel very small."

Garman pointed out that the vomerine teeth were very reduced, sometimes absent on one side or the other. We have found that the maxillary teeth of *T. culeus* are also much reduced in size.

As association exactly similar to that of *T. culeus* and *T. aemaricus* is found in the Lake Junin region where *T. jelskii* is the semiaquatic and *Batrachophyrnus microphthalmus* the lake-form. The latter species although currently placed in a different genus and family from *T. culeus* agrees entirely with it in most of its internal and external characters. Peters (Monatsber. Akad. wiss. Berlin, 1873, p. 413) and Werner (Abh. Zool.-anthro. mus. Dresden, 1901, **9**, no. 2, p. 13, fig.) have shown that Batrachophrynus is a Telmatobius in every particular except that it lacks the maxillary and vomerine teeth. A comparison of Batrachophrynus with *T. culeus* suggests that this difference is not fundamental or of any real significance.

In the appended descriptions we have included Philippi's *T. montanus* and *T. laevis*. We are strongly inclined to follow Boulenger's suggestion (Zool. record. Rept., 1902, p. 14) and disregard these names as well as those of the other utterly unrecognizable species which he has proposed (Supplementa a los Batraquios Chilenos descritos en la Historia fisica y politica de Chile de don Claudio Gay. Santiago, 1902). Nevertheless it seems highly probable that Philippi had some species of Telmatobius before him when he wrote his paper, so for the present it may be better to consider his proposed species valid.

Andersson's record (Ark. zool., 1906, **3**, no. 12, p. 4) of *T. jelskii* from the Andes of western Argentina and Werner's report (Zool.

jahrb. Suppl., 1897, **4**, p. 263) of *T. aemaricus* and *T. marmoratus* in Chile certainly require confirmation. The status of the genus in Chile is not at all clear.

Key.

A. Skin warty, at least provided with strong tubercles.
  B. Vomerine teeth in two small groups.
    C. Tibiotarsal articulation reaching the tip of the snout; color above brownish grey spotted with dark brown....*verrucosus* Werner.
    CC. Tibiotarsal articulation reaching the angle of the mouth; color above uniform blue-gray........................*hauthali* Koslowsky.
  BB. Vomerine teeth absent or barely visible.
    C. Entire upperside of legs provided with tubercles, a distinct color-pattern..............................*peruvianus* Wiegmann.
    CC. Tubercles on the legs restricted to the dorsal side of the tibia, no distinct color-pattern......................*pustulosus* (Cope).
AA. Skin smooth or granular.
  B. A strong supratympanic fold.
    C. Vomerine teeth prominent, in two large groups.
      D. Tympanum hidden.................*niger* Barbour & Noble.
      DD. Tympanum present................*ignavus* Barbour & Noble.
    CC. Vomerine teeth present or absent, generally in two very small groups.
      D. Skin very loose, large femoral flaps; tibiotarsal articulation reaches only to the corner of the mouth....*culeus* (Garman).
      DD. Skin loose only on the sides.
        E. Ventral coloration uniform pale below......*aemaricus* (Cope).
        EE. Ventral coloration sooty grey pale on throat only. *jelskii* (Peters).
  BB. No supratympanic fold.
    C. Vomerine teeth absent.
      D. Toes fully webbed.......................*montanus* Philippi.
      DD. Toes one quarter webbed......................*laevis* Philippi.
    CC. Vomerine teeth present.
      D. Tibiotarsal articulation not reaching the eye; color above brown mottled with black........*marmoratus* (Duméril & Bibron).
      DD. Tibiotarsal articulation extending to the anterior edge of the eye; color uniform brown above............*angustipes* (Cope).

TELMATOBIUS VERRUCOSUS Werner.

Telmatobius verrucosus Werner, Zool. anz., 1899, **22**, p. 482.

Diagnosis (extracted from original description). Vomerine teeth in two round groups between the choanae. Tympanum hidden. Toes webbed to the basis of the last phalanges, only in the fourth toe webbed to the base of the next to the last phalange; the free phalanges of the toes with a distinct seam in the skin, especially distinct on the outer edge of the fifth toe. Tibiotarsal articulation reaches the tip of the snout. Upper surface rugose, upper lip, appendages, and under surface smooth. A strong fold from the posterior edge of the eye to the corner of the mouth. Color above brownish grey, spotted with dark brown, the tubercles all dark brown. Ventral surface uniform light greyish brown.

Habitat. "Chaco, Bolivia." The species is known only from the original description.

TELMATOBIUS HAUTHALI Koslowsky.

Telmatobius hauthali Koslowsky, Revista Mus. La Plata, 1895, **6**, p. 359, pl. 1.
(?)*Telmatobius jelskii* Andersson, Arkiv. zool., 1906, **3**, no. 12, p. 4.

Diagnosis (extracted from original description). Vomerine teeth in two small groups between the choanae. Toes more than half webbed, a free border extending along the interior edge of the tarsus, and on the outer side of the interior toe. The leg extended forward reaching with the tibiotarsal articulation the angle of the mouth. Skin smooth, covered with numerous horny tubercles on the chest, back, abdomen, and appendages. Lead color or blue-grey above, darker on the head region; ventral surface dirty yellowish white; some specimens mottled with dark tone on the posterior part of the ventral surface, all specimens uniform above.

Habitat. The type-locality: Andes of Catamarca, Argentina, Aguas Calientes, a streamlet 4,060 meters above sea-level.

Remarks. Oddly enough this species has been found only in the warm waters of a hot spring. In the type description Koslowsky (1895, p. 360) says:—"Señor Rodolfo Hauthal los tomó en el arroyo, cuyas aguas siempre conservan una temperatura de veinte grados, Celsius." How different from the frigid waters of Lake Titicaca, the home of the closely related *T. culeus!*

TELMATOBIUS PERUVIANUS Wiegmann.

Telmatobius peruvianus Wiegm., Nova acta, 1835, p. 262, pl. 22, fig. 2.
Telmatobius peruvianus Boulenger, Cat. Batr. Sal. Brit. mus., 1882, p. 191.

Diagnosis (extracted from the original description). Presence of vomerine teeth questionable. Toes with short webs. Skin finely granular, covered upon the head, the whole back and the upper surface of the legs with many small flattened tubercles, each of which is provided with a hard, horny point, dark in color. Skin of under surface smooth except for the characteristic horny tubercles in the pectoral region characteristic of the male Telmatobius, in the breeding season. Color above brown, a darker band extending from the snout to the foreback forming with two cross-bands drawn from the ear to the shoulder region a feeble double cross; under surface of the body and legs a brown-yellow.

Habitat. Cordillera de Guatilla, near the town of Palca, two days' journey east of Tacna, Chile (Meyen).

Remarks. It is highly probable that *T. peruvianus* is a land-frog with habits similar to those of *T. acmaricus,* for Meyen says in his account of finding the type: —

"Unser Nachtlager schlugen wir einer natürlichen Höhle des dicht daneben anstehenden Gesteines auf;. . .gegen Abend liess sich das Quaken eines Frosches hören." (Reise um die erde, 1834, p. 450).

TELMATOBIUS PUSTULOSUS (Cope).

Cyclorhamphus pustulosus Cope, Proc. Amer. philos. soc., 1877, **17,** p. 39.
Telmatobius pustulosus Boulenger, Cat. Batr. Sal. Brit. mus., 1882, p. 192.

Diagnosis. A rather large species, the skin not especially loose but with tubercles present on sides, belly, lower side of forearm, vent region, and lower back and upper surface of tibia and sole of foot; vomerine teeth barely visible; no distinct color-pattern.

Habitat. This was another of Professor Orton's discoveries during his exploration of the Peruvian Andes. He secured the type and only specimen known or recorded, at Tinta, a small town at an elevation of 11,400 feet in the Department of Cuzco, Southern Peru.

Type. Acad. nat. sci. Phil., 11,401; Tinta, Peru; altitude 11,400 ft.

Description of Type. Size moderate; head broader than long, much broader than body, its length contained in the total length of body 3.2 times; snout rounded with no distinct *canthus rostralis;* nostrils although at the end of the superior plane of the muzzle, equidistant between the orbit and the labial border. Vomerine teeth barely visible, in two very small groups between the choanae which are much enlarged; tongue small, nearly round. Interorbital space 1.2 as broad as the length of the eye; the length of the snout 1.4 as long as the length of the eye; tympanum concealed by the skin, but on one side indicated by a vertical oval, the greatest diameter of which is one half the length of the eye. Digits free, slender, without discs; the first and second fingers equal in length and shorter than the fourth; the elbow extended forward reaches a little beyond the orbit. Toes slender, without discs, less than half webbed; subarticular tubercles only moderately developed; a distinct inner metatarsal tubercle but no outer; heels barely in contact when the hind limbs are folded at right angles to the axis of the body; the tibiotarsal articulation reaches the anterior edge of the orbit when the hind limbs are carried forward along the body. Skin smooth except for the low tubercles on the sides of the body, underside of forearms, posterior dorsal surface of body, region around the vent, dorsal side of the tibia, and ventral side of the foot; the tubercles on the sides of the body much larger than the others, and more whitish in color. No glandular folds on the dorsal surface, a few longitudinal creases on the ventral surface.

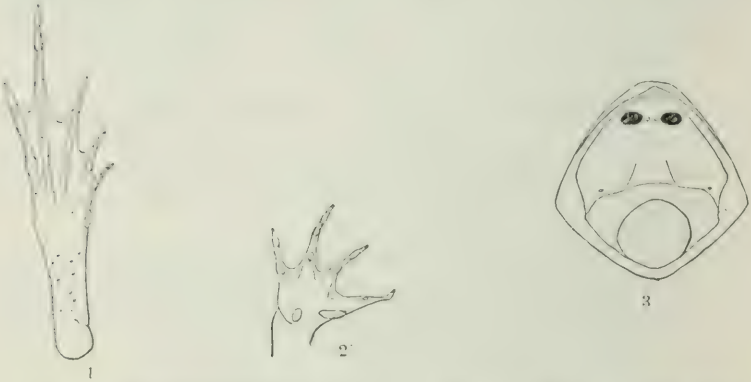


FIG. 3.— **Telmatobius pustulosus (Cope). 1. Foot. 2. Hand. 3. Open mouth.**

Color above brown with a few indistinct darker markings; light brown below, gular region and lateral tubercles milky white.

Dimensions.

Tip of snout to vent	58.5	mm.
Tip of snout to posterior end of mandibular bone	21	"
Greatest width of head	22	"
Fore leg to tip of longest finger	36	"
Hind leg to tip of longest toe	85.5	"

TELMATOBIUS NIGER, sp. nov.

Diagnosis. A medium-sized frog, with finely granular skin; a strongly developed supratympanic fold, the vomerine teeth well developed in two large prominent groups and with the tympanum hidden.

Habitat. Many years ago a series of seven or eight of these frogs were given the senior author by Mr. R. L. Ditmars, to whom they were presented by a mining or railway engineer who had been to Ecuador probably working on the Quito-Guayaquil Railroad at that time under construction. They bore a label "Palmira Desert, Ecuador, 10,500 feet altitude." It has been impossible to identify this locality with absolute certainty, but the Palmira is very probably the one referred to as the hacienda de Palmira in the Andes of southern Ecuador by Theodoro Wolf in his Geografia y Geologia del Ecuador (Leipzig, 1892, p. 35). The village of the hacienda is a few miles south of Vilcabamba in the Province of Loja and is said to have an altitude of 1,748 meters. This is but half the altitude given on our label. There may be another Palmira or the "desert" may in reality be a Paramo, of the same name as the hacienda, not far away in the highlands south of Loja.

Type. M. C. Z. 3,037 from Palmira Desert, Ecuador. Coll. Thomas Barbour, 1909.

Description of Type. Size moderate; head broader than long, about equal to the width of the body, its length contained in the total body length 3.3 times; snout very short and high without *canthus rostralis,* nostril nearer the orbit than the labial border. Vomerine teeth prominent in two well-defined groups between the choanae which are of moderate size; tongue longer than broad. Interorbital space 1.3 as broad as the length of the eye; the length of the snout 1.4 times that of the eye; tympanum hidden, the region partly covered by the supratympanic fold. Digits free, stout, slightly dilated at the tips, the first finger longer than the second but shorter than the fourth; the elbow extended forward reaches nearly to the eye. Toes fully webbed, the webs notched making the toes appear only slightly more than half webbed; a distinct tarsal fold; subarticular tubercles well developed; the inner metatarsal tubercle much larger and more prominent than outer; heels not in contact when the hind limbs are folded at right angles to the axis of the body; the tibiotarsal articulation reaches to the middle of the eye when the hind limb is carried forward along the body. Skin very glandular above, the glands being so small that the skin appears granular and not warty; a loose, baggy, latera fold on each side, the fold beginning at the posterior angle of the eye and con tinuing to the groin; in the supratympanic region this fold somewhat swollen resembling on one side a parotid gland; skin on the sides of the body loose and folded; ventral disc marked off by a transverse fold between the fore limbs and by two longitudinal creases, one on either side of the belly; skin on the thighs loose, but no posterior flap.

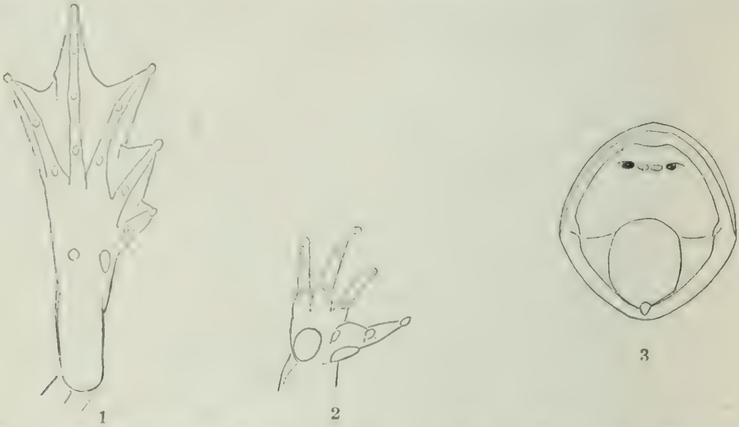


Fig. 4.— Telmatobius niger Barbour & Noble. 1. Foot. 2. Hand. 3. Open mouth.

Color above very dark chestnut-brown; ventral surface yellow, heavily mottled and spotted with dark brown; the spots most abundant on the throat, east so upon the thighs; tips of fingers and toes yellow.

Dimensions.

Tip of snout to vent	61 mm.
Tip of snout to angle of jaw	21 "
Greatest width of head	22 "
Fore leg to tip of longest finger	37 "
Hind leg to tip of longest toe	91 "

Remarks. The only specimens known are the typical series some of which have been distributed under the name of *Telmatobius jelskii* to the U. S. N. M. and possibly elsewhere. Until topotypes of *jelskii* were secured recently, we had these two species confused.

TELMATOBIUS IGNAVUS, sp. nov.

Diagnosis. A medium-sized smooth-skinned frog with strongly developed supratympanic fold, the vomerine teeth well developed in two large prominent groups and with the tympanum exposed.

Habitat. Central Cordillera of Piura, northern Peru. It may perhaps also be expected to occur in the higher portions of Cajamarca and Lambayeque.

Type. M. C. Z. 4,093 within the town limits of Huancabamba, Piura, Peru; 5 August, 1916, G. K. Noble.

Description of Type. Size moderate; head broader than long, much narrower than the body, its length contained in the total length of the body just three times; snout rounded and flat without *canthus rostralis,* nostril slightly nearer the orbit than the labial border. Vomerine teeth in two large groups between the choanae which are very small; tongue moderate in size, longer than broad. Interorbital space 1.4 as broad as the length of the eye; the length of the snout 1.5 times that of the eye; tympanum one fourth the diameter of the eye, partly covered by the supratympanic fold. Digits free, stout, slightly dilated at the tips, the first finger longer than the second but shorter than the fourth; the elbow extended forward reaches slightly beyond the tympanum. Toes more than half webbed, but the webs notched, making the toes appear only one third webbed; a narrow border of free skin on the inner side of the tarsus; subarticular tubercles distinct; the inner and outer metatarsal tubercles well developed; heels just in contact when the hind limbs are folded at right angles to the axis of the body; the tibiotarsal articulation reaches nearly to the posterior edge of the orbit when the hind limbs are carried forward along the body. Skin smooth; upper surface of body, and appendages somewhat glandular, the glands appearing as irregular patches of pores; a well-developed lateral fold, beginning at the posterior angle of the orbit and extending to the groin; skin on the sides of body very loose and baggy; ventral disc marked off by a transverse fold between the fore limbs and two

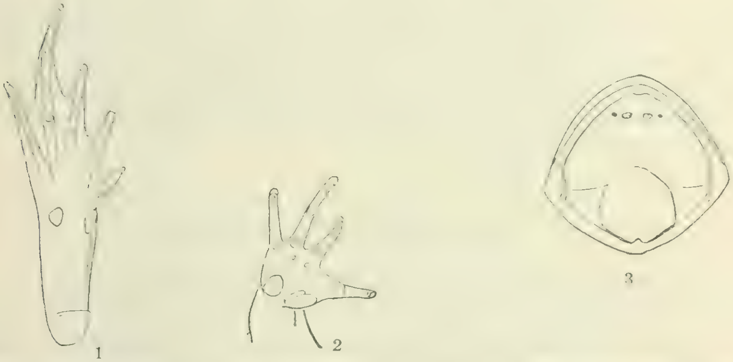


Fig. 5.— Telmatobius ignavus Barbour & Noble. 1. Foot. 2. Hand. 3. Open mouth.

longitudinal ones on either side of the belly; skin on the thighs somewhat loose, but without posterior flaps.

Color above dark reddish brown faintly marked by large spots of a darker color; ventral surface uniform cream-white mottled on the thighs with brown and pure white.

Dimensions.

Tip of snout to vent	54.5	mm.
Tip of snout to posterior end of mandibular bone	20	"
Greatest width of head	22	"
Fore leg to tip of longest finger	32	"
Hind leg to tip of longest toe	72	"

Remarks. The type and only specimen secured was taken in a small cistern at the western end of the town of Huancabamba. The junior author was searching for Gastrotheca larvae in this cistern, not three feet in diameter, when he suddenly espied this good-sized frog. None of the boys present seemed to know it, for to his urgent "*Como se lláma ésta Rana,*" they only shook their index-fingers in that peculiar wagging manner by which the Peruvian "*cholo*" signifies that he does not know. Diligent collecting in the streams about Huancabamba for a month did not reveal another specimen.

TELMATOBIUS CULEUS (Garman).

Cyclorhamphus culeus Garman, Bull. M. C. Z., 1875, **3**, p. 276, pl. .
Telmatobius jelskii (?) Boulenger, Cat. Batr. Sal. Brit. mus., 1882, p. 191 (*pars*).

Diagnosis. A very large species, with a smooth loose, baggy skin; vomerine teeth so reduced as to be almost invisible; strong supratympanic, lateral and femoral folds or lappets; the tibiotarsal articulation reaching only the angle of the jaws.

Habitat. Confined to Lake Titicaca where it leads an absolutely aquatic existence.

Type. M. C. Z., 1,077 from bottom of Lake Titicaca, Peru; taken dredging by S. W. Garman, in eleven fathoms off Achacache, Bolivia.

Description of Type. Size very large; length of the head contained in the breadth 1.5 times, in the total length 3.8 times; snout round, very flat without *canthus rostralis;* nostril minute, slightly nearer the orbit than the labial border. Vomerine teeth reduced to a few very small spines which scarcely break through the buccal epithelium at two points between the choanae; the choanae enlarged and at a slight angle to each other; tongue small, longer than broad. Interorbital space nearly two times as broad as the length of the eye; tympanum hidden, the region covered by two loose flaps of skin. Digits slender but edged on either side by a seam of skin which does not develop into a web, tips not dilated; the first finger a trifle longer than second, equal in length to the fourth; the elbow extended forward reaches only about three fourths of the distance to the orbit. Toes fully webbed but deeply notched, making them appear slightly more than half webbed; a free border of skin on the inner side of the tarsus and a narrower one on the outer edge of the fourth toe; subarticular tubercles barely visible, the metatarsal tubercles the most distinct; heels almost in contact when the hind limbs are folded at right angles to the axis of the body; the tibiotarsal articulation reaches slightly beyond the angle of the mouth, when the hind limb is carried forward along the body. Skin smooth, the entire upper surface glandular, the glands appearing as numerous small depressions; skin very loose and baggy, falling into a number of large folds and flaps; a supraocular fold continued posteriorly to form a supratympanic and lateral fold, several transverse folds on the sides; a very wide, loose, liquid-filled bag or flap extending along the posterior side of each thigh; many folds on the appendages due to the loose character of the skin.

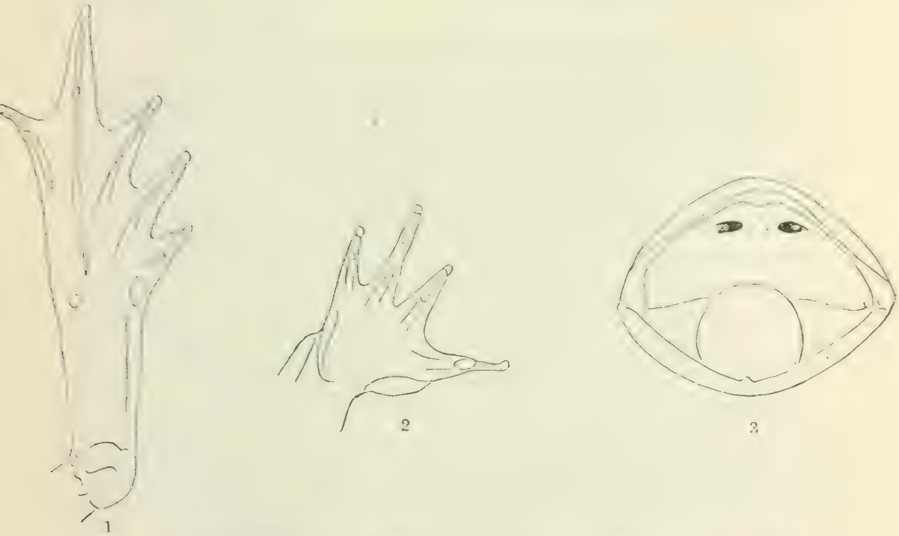


Fig. 6.— Telmatobius culeus (Garman). 1. Foot. 2. Hand. 3. Open mouth.

Color slate-grey above thickly spotted with white; the spots more abundant ventrally giving the under surface a lighter appearance.

Dimensions.

Tip of snout to vent	97	mm.
Tip of snout to posterior end of mandibular bone	36	"
Greatest width of head	43	"
Fore leg to tip of longest finger	52.5	"
Hind leg to tip of longest toe	135	"

Remarks. Mention has already been made of the probable evolution of *T. culeus* from *T. aemaricus.* Garman is the only herpetologist who has ever published upon the peculiar subaqueous existence of *T. culeus.* In the original description he says:—

"These animals are very abundant in the extensive beds of weeds which occur on the bottom of Lake Titicaca. They feed on the molluscs, crustacea, worms, etc., and are fed upon by birds and fishes. Marmoratus [= *aemaricus*] was found in little creeks and marshy places, in situations indicating habits similar to the common Ranæ; during the two months of the observations culeus was only to be found in the lake, crawling lazily about among the weeds or half hidden by them, watching for prey. The latter was the only one found in the vicinity; the former was secured on the summit and the western slope. These animals are able to remain under for great lengths of time without coming up for air; hours of watching in clear water where many could be seen, failed to detect any approaching the surface. It is possible that they are more lively at night, when their enemies are less active. Numbers were brought up in the trawl at more than four miles from the shore. None were found on the land. The natives were positive they never left the water. All stages of the animal are represented by the specimens in the collection."

Mr. Garman in conversation, adds the following facts:—the species is far more abundant in the southern than in the northern end of the Lake. The large specimens obtained were mostly caught near Guaqui or Copacabana. None were observed or dredged in the great northern bay north of the Capachica Peninsula. Neither Garman nor the senior author, who visited Lake Titicaca in 1909 found that the Indians used *culeus* for food. This is a common custom at Lake Junin with *Batrachophrynus microphthalmus,* whose habits are very similar to those of the Titicaca frog.

The following material in addition to the type remains in the Museum of Comparative Zoölogy, of Garman's collecting, after a considerable number of specimens have been distributed to other institutions.

2 very large adults from Copacabana, Bolivia.
1 half-grown specimen from Lake Titicaca, (no further data).
5 half-grown specimens from Carapata Bay, Bolivia.
6 half-grown specimens from Desaguadero Bay, Bolivia.
1 half-grown specimen from Puno, Peru.
8 larvae from Puno, Peru.

Telmatobius aemaricus (Cope).

Cyclorhamphus aemaricus Cope, Proc. Acad. nat. sci. Phil., 1874, p. 125.
Cyclorhamphus marmoratus Garman, Bull. M. C. Z., 1875, **3**, p. 276.
Telmatobius aemaricus Boulenger, Cat. Batr. Sal. Brit. mus., 1882, p. 191.

Diagnosis. A small species with smooth skin; a strong supratympanic fold; vomerine teeth present in two small or but moderately developed groups; skin loose on the sides only and belly uniformly pale.

Habitat. Reported from about Lake Titicaca (type-locality) and from other stations nearby; as from Vincocaya (Garman); Cuzco (Cope, Proc. Amer. philos. soc., 1877, p. 39); Arequipa (Garman), and Yura near Arequipa (Cope, *Loc. cit.*).

Type. Acad. nat. sci. Phil., 11,400 from Lake Titicaca, Peru.

Description of Type. Size moderate; head broader than long, much narrower than the body, its length contained in the total length of body 3.4 times; snout rounded and flat without *canthus rostralis;* nostril nearer the orbit than the labial border. Vomerine teeth barely visible in two small groups between the choanae which are also small; tongue moderate in size, nearly round. Interorbital space 1.1 as broad as the length of the eye, the length of the snout 1.2 as long as the length of the eye; tympanum entirely concealed and covered

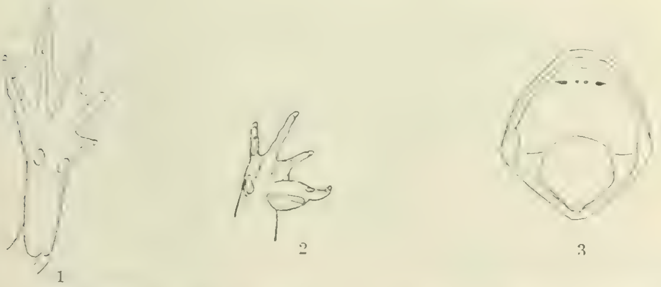


Fig. 7.— Telmatobius aemaricus (Cope). 1. Foot. 2. Hand. 3. Open mouth.

by a loose flap of skin. Digits free, stout, slightly dilated at the tips; the first and second fingers equal in length and only a trifle shorter than the fourth; the elbow extended forward reaches the posterior edge of the orbit. Toes fully webbed, but the webs so fully notched that they appear only half webbed; a free border of skin on the inner side of the tarsus and another on the outer side of fourth toe; subarticular tubercles slightly developed; a distinct inner and a low outer metatarsal tubercle; heels nearly in contact when the hind limbs are folded at right angles to the axis of the body; the tibiotarsal articulation reaches about two millimeters behind the posterior edge of the orbit when the hind limbs are carried forward along the body. Skin smooth except for a few low tubercles on the head and shoulders, the tubercles most abundant in the occipital region; clusters of horny spines, characteristic of the male in the breeding season, grouped on the chest and outer side of thumb; a well-developed supratympanic fold which extends to the groin; two transverse folds and a number of flat tubercles just posterior to the angle of the mouth; several folds on the sides of the body; two loose flaps of skin extending the length of the posterior side of the thighs.

Color above dark brown indistinctly mottled and spotted with darker brown, color below uniform yellowish grey.

Dimensions.

Tip of snout to vent	46	mm.
Tip of snout to posterior end of mandibular bone	16	"
Greatest width of head	15.5	"
Fore leg to tip of longest finger	28	"
Hind leg to tip of longest toe	64	"

Remarks. Cope says in the type description:— "Labial integument largely free and overhanging the lower jaw." We have examined carefully the five paratypes (Acad. nat. sci. Phil. 1,435–1,457, 16,177, 16,178) and it is certain that the labial integument of the type-specimen has been artificially torn away from the skull. The paratypes are much better preserved than the type and the labial integument of each one is normal. The labial integument is likewise attached to the skull, normally, of course, in the ten specimens, nine from Vincocaya and one from Arequipa (M. C. Z.).

TELMATOBIUS JELSKII (Peters).

Pseudobatrachus jelskii Peters, Monatsb. Berl. akad., 1873, p. 415.
Cyclorhamphus marmoratus Günther, P. Z. S. London, 1859, p. 89.
Telmatobius jelskii Boulenger, Cat. Batr. Sal. Brit. mus., 1882, p. 191.

Diagnosis. A medium-sized frog with smooth, somewhat loose skin; with a strong supratympanic fold; vomerine teeth not greatly developed, in two small groups; the tibiotarsal articulation reaching nearly to the eye and having a dark sooty grey ventral surface except for the throat which is conspicuously pale.

Habitat. Mountain streams of the high Andes of Central Peru.

Description. Adult M. C. Z. 4,796 from Tarma, Central Peru 1916; John M. Boutwell.

Size moderate; head scarcely broader than long, about equal to width of body, its length contained in total length of body $3\frac{1}{5}$ times; snout declivous, rounded, somewhat projecting, without *canthus rostralis;* nostril slightly nearer orbit than tip of snout. Vomerine teeth in two tiny groups, very feebly developed, situated directly between and nearly touching the choanae; each aperture being much larger than a group of the teeth; tongue moderate, slightly longer than broad. Interorbital space very slightly wider than upper eyelid; the length of the snout one and one half times that of the eye; tympanum hidden. Digits free, scarcely dilated at the tips, the first finger equal to the second, much shorter than the fourth; the elbow extended forward reaches the center of the eye. Toes extensively webbed, but webs incised to appear but half developed; a distinct tarsal fold; subarticular tubercles distinct, the inner metatarsal twice as long as the outer; heels just touching when the hind limbs are folded at right angles to the axis of the body; the tibiotarsal articulation reaching the posterior border of the eye when the hind limb is carried forward along the body. Skin above glandular, smooth or slightly spiny, a well-developed dermal lateral fold from orbit to groin; skin on sides of body very loose and baggy; abdominal area ill-defined by folds; skin of thighs loose and baggy also.

In the male described, there is a prominent area covered with fine asperities on the chest as well as the usual digital asperities, which on the thumb are extraordinarily developed.

Color uniform slate above, faintly spotted with darker; ventral surface dirty yellow washed with dusky grey; a pale area beneath each thigh; throat pale, unspotted.

Dimensions.

Tip of snout to vent	55 mm.
Tip of snout to angle of jaw	20 "
Greatest width of head	21 "
Fore leg to tip of longest finger	32 "
Hind leg to tip of longest toe	79 "

Remarks. This species, described by Peters, was obtained during Count Jelski's journey in Peru, and the type-locality is the small village of Acancocha near Vitoc. At our request Mr. John M. Boutwell, a mining geologist at the Cerro de Pasco mines, kindly made a special effort to secure a series of this little-known species. He procured two lots of beautifully prepared examples from near Tarma and Palca, two stations in the Oroya district and practically topotypes.

TELMATOBIUS MONTANUS Philippi.

Telmatobius montanus Philippi, Supl. Batr. Chilenos Santiago, 1902, p. 47.
(?)*Telmatobius aemaricus* Werner, Zool. jahrb. Suppl., 1897, **4**, p. 263.
(?)*Telmatobius marmoratus* Werner, Zool. jahrb. Suppl., 1897, **4**, p. 263.

Diagnosis (extracted from original description). Indistinguishable from *T. laevis* except for the narrower head and the toes which are fully webbed.

Habitat. A lake in the high Andes of the Province of Santiago, Chile.

Remarks. *Telmatobius montanus* is evidently the water-form of *T. laevis.* It bears the same relation to *T. laevis* which *T. culeus* bears to *T. aemaricus.* Philippi in describing *T. laevis* states that it comes from a pasture, while he states clearly that *T. montanus* was found in a lake. If Philippi's descriptions may be relied upon, it is very probable that the same evolution with change of structure has taken place in Chile as well as in the Andes of southern Peru, where there has been a change from a land to a completely aquatic mode of life.

TELMATOBIUS LAEVIS Philippii.

Telmatobius laevis Philippi, Supl. Batr. Chilenos, Santiago, 1902, p. 43.

Diagnosis (extracted from original description). No vomerine teeth; choanae very large. Nostrils nearer the eye than the tip of the snout. Tympanum hidden, covered by undifferentiated skin. Toes one fourth webbed. Skin entirely smooth, no glands on any part of the body. Color above black, no trace of markings; ventral surface light grey, similarly without markings, fingers somewhat lighter in color, especially at the point.

Habitat. Chile; range probably restricted to some of the pasture-lands of the Andes. Philippi (*Loc. cit.*, p. 44) states that the type-specimens come from "Potrero," in other words from a pasture.

There are five towns known as Potrero in Chile. The specimens probably came from some one of these localities rather than from some wholly indefinitely located pasture.

TELMATOBIUS MARMORATUS (Duméril and Bibron).

Cycloramphus marmoratus Duméril et Bibron, Erpét. gén., 1841, 8, p. 455.
Cyclorhamphus marmoratus Peters, Monatsb. Berl. akad., 1873, pl. 2, fig. 2, pl. 3, fig. 3.
Telmatobius marmoratus Boulenger, Cat. Batr. Sal. Brit. mus., 1882, p. 192.

Diagnosis (extracted from original description). Vomerine teeth in two very small groups between the choanae. Toes half webbed. The tarsometatarsal joint reaches the tip of the snout when the hind leg is extended forward. Skin perfectly smooth, neither glands nor tubercles on any part of the body. Ground-color above grey varying to brown; upper surface marbled with black and generally irregularly covered with little white spots. Ventral surface grey, with or without black marblings, the appendages darker than the throat or abdomen.

Boulenger (1882, p. 192) adds in part to this description: — Choanae large. Tympanum small, hidden. The hind limb carried forward along the body, the tibiotarsal articulation does not reach the eye. A flat parotoid gland frequently indistinct.

Habitat. Huasacona, a hacienda in the District of Asángaro, Department of Puno, Peru.

Remarks. Duméril and Bibron (1841, p. 455) in describing the species say:—

> "Cette espèce est une découverte faite au Chili par M. Pentland; le lieu où elle a été trouvée par ce savant naturaliste se nomme Guasacona."

We have made a vain search for this locality in all the old maps and statistical volumes at our disposal. There seems to have been no locality by that name in either Chile or Bolivia. There is, however, in Peru just one Guasacona, a hacienda of 221 (Resumen * * * habitantes del Peru en 1876, 1878, p. 104) or 427 (Soldan, Dicc. geogr. estad. Peru, 1877, p. 427) inhabitants. *Telmatobius marmoratus* has been recorded from Chile by Werner (1897, p. 263), but this is most probably a case of misidentification. There is no good evidence to show that any specimens of *T. marmoratus* besides the types have ever been taken.

TELMATOBIUS ANGUSTIPES (Cope).

Cyclorhamphus angustipes Cope, Proc. Amer. philos. soc., 1877, **17**, p. 38.
Telmatobius angustipes Boulenger, Cat. Batr. Sal. Brit. mus., 1882, p. 192.

Diagnosis. A rather small species, with smooth skin, no supratympanic fold; vomerine teeth present and moderately developed; the tibiotarsal articulation reaching the anterior border of the eye and in color uniform brown above.

Habitat. The type of this distinct and long-legged species formed a part of the collection of Prof. James Orton's fruitful journey to Peru in 1876–77. The single example which Cope described came from Juliaca, a few miles west of Lake Titicaca, a desolate old town at an altitude of 12,550 feet.

Type. Acad. nat. sci. Phil. 11,389 from Juliaca, Peru; altitude 12,550 ft.

Description of Type. Size small; head exactly as long as broad, slightly narrower than body, its length contained in the total length a little more than three times; snout rounded, high but with the *canthus rostralis* obsolete, nostrils slightly nearer the orbit than the labial border. Vomerine teeth in two small groups between the choanae which are large and at an angle to each other, tongue longer than broad. Interorbital space 1.25 as broad as the length of the eye; the length of the snout 1.1 as long as the length of the eye; tympanum entirely concealed by the skin. Digits free, slender, without discs, the first finger a trifle shorter than the second, much shorter than the fourth; the elbow extended forward reaches nearly to the center of the orbit. Toes slender, without discs, about one third webbed; subarticular tubercles not distinct; only a slight indication of the inner metatarsal tubercle; heels slightly over-

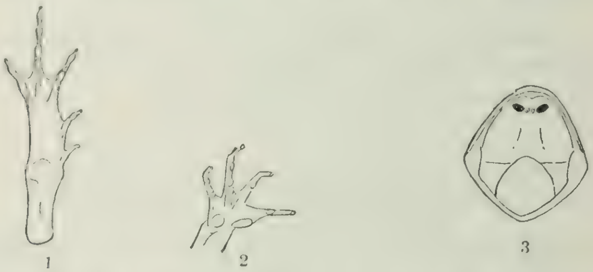


FIG. 8.— **Telmatobius angustipes (Cope). 1. Foot. 2. Hand. 3. Open mouth.**

lapping when the hind limbs are folded at right angles to the axis of the body; the tibiotarsal articulation reaches a little beyond the orbit when the hind limbs are carried forward along the body. Skin entirely smooth. No folds or creases on the body.

Color above uniform dark brown; light yellowish brown below.

Dimensions.

Tip of snout to vent	37	mm.
Tip of snout to posterior end of mandibular bone	13.5	"
Greatest width of head	12.5	"
Fore leg to tip of longest finger	24	"
Hind leg to tip of longest toe	58	"

Remarks. *Telmatobius angustipes* is closely related to *T. marmoratus,* but differs from it in several characters, the most important of which is the greater leg length. It is only in a country of such striking physiographic barriers as Peru that two species so closely related may occur so near each other.

BUFONIDAE.

BUFO MARINIS (Linné).

This extremely widespread species was met with at Palambla (8 specimens), Perico (6 specimens) and at Chumayo (5 specimens) while a large series of tadpoles and very young were secured at Bellavista.

BUFO SPINULOSUS Wiegmann.

This wide ranging Andean toad was found at Huancabamba where three large adults were caught and at Chumayo where three others were taken. These bear close comparison with specimens from southern Peru and the mountains of Chile and Argentina.

BUFO TYPHONIUS (Linné).

This form so characteristic of the tropical lowlands of South America was found abundantly at Perico, Bellavista, and Querocotilla while four were found in the rain forest at Tabacónas.

HYLIDAE.

GASTROTHECA MONTICOLA, sp. nov.

Diagnosis. Closely related to *G. marsupiatum* from which it may be distinguished by the following characters: — Vomerine teeth in two straight confluent series on a level with the hinder edge of the choanae. Snout a little longer than the diameter of the eye. Loreal region slightly concave. Interorbital space once and a third the diameter of the eye, strongly concave. Toes two thirds webbed. The hind leg being carried forward along the body the tibiotarsal articulation reaches between the eye and the nostril. Skin smooth or finely granular above, generally granular on the head and sides. Size large, the pouched female at least sixty-one millimeters from snout to vent, generally sixty-eight millimeters, coloration somewhat different from *G. marsupiatum;* female with irregular dark blotches on the back, never forming two symmetrical stripes as in that species.

Range. Only known from the low central Andean range of northern Peru from Huancabamba south to Querocotilla.

Type. M. C. Z. 5,290 from Huancabamba, northwestern Peru; 15 August, 1916, G. K. Noble.

Description of Type (adult female with empty pouch). Size large; head about as broad as the body, much broader than long; snout blunt forming a semicircle with distinct *canthus rostralis* and concave loreal region; orbital diameter equals the distance of the eye from the nostril, which is very near the end of the snout; interorbital space about twice as broad as an upper eyelid. Tongue large oval, slightly emarginate behind. Vomerine teeth in two ovoid groups, touching each other and forming a straight line between the posterior halves of the choanae. Tympanum three fifths the size of the orbit. Fingers with a very slight rudiment of a web; the first finger equal in length to the second; toes two thirds webbed, *e. g.* two inner toes webbed to base of penultimate phalanx, third to middle of penultimate, fourth about one third the length of the antepenultimate and fifth almost to the end of the penultimate; discs distinct, about one third of their width broader than the penultimate phalanx, distinctly narrower than the width of the tympanum; subarticular tubercles well developed; a large inner metatarsal tubercle and a distinct fold along the inner side of the tarsus. Tibiotarsal articulation reaches the nostril, or not quite so far. Skin finely granular on the back, coarsely granular on the sides and very coarsely granular on the ventral surface; a slight indication of a dorsolateral fold.

Color in alcohol generally bluish grey above; a dark greyish spot between the eyes; a broader one in the scapular, and a narrower one in the iliac region. (In life the ground-tone was brilliant green, and the pattern was dark brown), a dark stripe along the *canthus rostralis* and dorsolateral fold; sides of the body heavily marbled with black and white; lips white; appendages barred with greyish brown; posterior surfaces of the thighs and under sides of the legs mottled with dark brown; ventral surface of the head and body white, immaculate.

Dimensions.

Distance from snout to the vent	63	mm.
Greatest width of head	23	"
Distance from axilla to tip of largest finger	40	"
Distance from groin to tip of largest toe	101	"

Remarks. Gastrotheca monticola is readily distinguishable from all the specimens of *G. marsupiatum* examined by its much larger size. The several pouched females of *G. marsupiatum* in the M. C. Z. from Ecuador vary from 43 to 48 millimeters in length (snout to vent), while none of the ten pouched females of *G. monticola* in our series are less than 61 millimeters in length.

Unlike *G. boliviana* and perhaps other species of Gastrotheca, this species exhibits a well-marked sexual dimorphism. The males in life were always some shade of tan and were heavily blotched with brown. These markings often formed a)(-shaped figure in the pectoral region. The females were always green and were less heavily marked. Sometimes the females were uniformly green above except for the eye-stripe and a few dark markings on the sides of the body.

EXPLANATION OF THE PLATES.

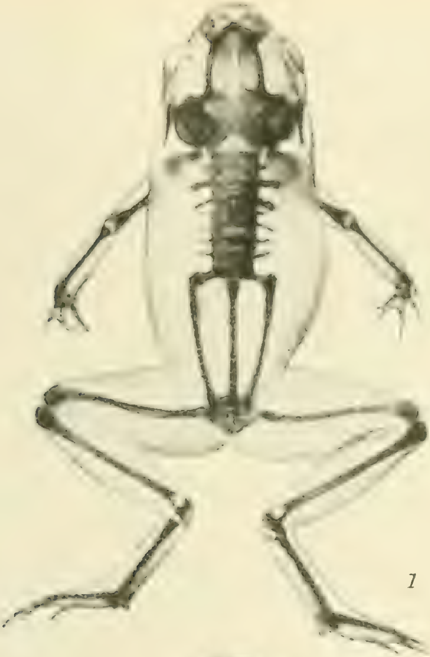
PLATE 1

PLATE 1.

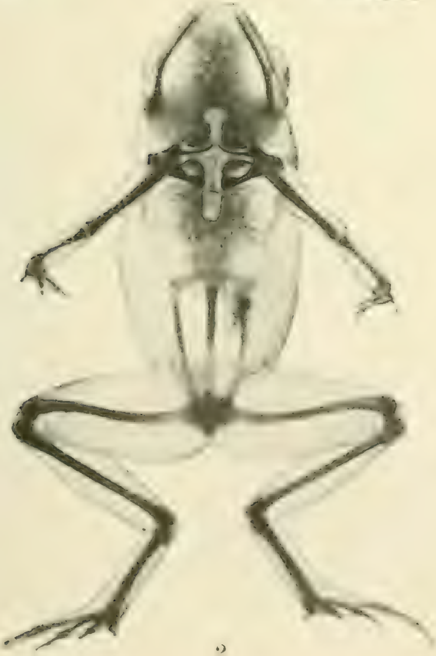
Sminthillus limbatus (Cope).

Fig. 1.— Dorsal view.

Fig. 2.— Ventral view.
Specimen cleared after Schultze's method by Thomas Barbour in 1913.



1



2

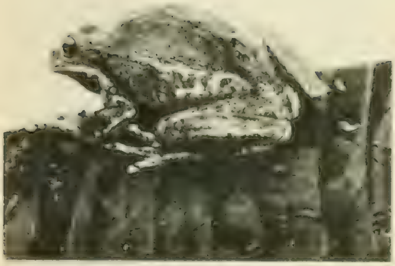
PLATE 2.

PLATE 2.

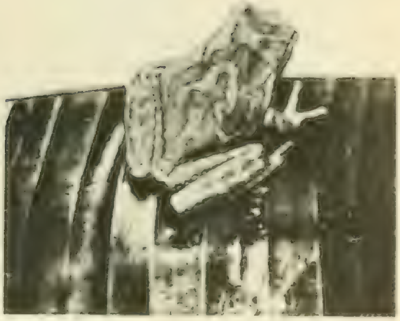
Fig. 1.— Gastrotheca monticola Barbour and Noble.
Female with pouch containing an advanced embryo. A tadpole may be seen at the orifice.

Fig. 2.— Gastrotheca monticola Barbour and Noble.
Male. The male is always more striped than the adult female.

Fig. 3.— Humid subtropical zone near Charápe.



1



2

3

PLATE 3.

PLATE 3.

Fig. 1.— Arid subtropical zone near Querocotilla.

Fig. 2.— Interior arid plain near Perico.

1

2

Bulletin of the Museum of Comparative Zoölogy
AT HARVARD COLLEGE.
Vol. LXIII. No. 9.

DOGS OF THE AMERICAN ABORIGINES.

By Glover M. Allen.

With Twelve Plates.

CAMBRIDGE, MASS., U. S. A.:
PRINTED FOR THE MUSEUM.
March, 1920.

No. 9.— *Dogs of the American Aborigines.*

By Glover M. Allen.

CONTENTS.

Page.
Introduction 431
Acknowledgements 432
Origin of the Domestic Dog 432
Origin of American Dogs 439
Breeds of American Aboriginal Dogs 440
    Eskimo Dog 442
    Plains-Indian Dog 449
    Sioux Dog 455
    Long-haired Pueblo Dog 456
    Larger or Common Indian Dog 457
    Klamath-Indian Dog 463
    Short-legged Indian Dog 464
    Clallam-Indian Dog 469
    Inca Dog 472
    Long-haired Inca Dog 475
    Patagonian Dog 476
    Mexican Hairless Dog 478
    Small Indian Dog or Techichi 481
    Hare-Indian Dog 491
    Fuegian Dog 492
    Short-nosed Indian Dog (Pachycyon) 495
    Peruvian Pug-nosed Dog 500
Summary 503
Bibliography 504
Explanation of the Plates

Introduction.

When Columbus, in 1492, made his discovery of land in the Western Hemisphere, he found it already peopled by a race of men who are considered by modern ethnologists to be of Asiatic origin, and probably of an antiquity dating back not many thousands of years. Yet these aboriginal peoples were considerably diversified as to appearance, language, and customs. In South America, the Incas had domesticated animals, llamas and alpacas, whose wild progenitors are the last remnant of the once diverse phylum of American camels. There is no good evidence, however, that the horse which survived in North America till late Pleistocene times was ever known to the aborigines until its reintroduction by Europeans. Dogs they had, nevertheless, universally and in some variety. Yet at this late date it is hardly possible to define the various breeds or variations with any exactness or to throw much light on the question of their ultimate origin. An attempt is made here to gather what information the earlier travellers recorded as to the appearance of the dogs of the American aborigines, and so far as may be, to characterize the various breeds that can be distinguished.

A bibliography is added giving the more important papers on the origin of the dog, and on prehistoric dogs of the Old World, as well as references to the aboriginal dogs of America.

Acknowledgements.

For the opportunity of studying dog-remains from various parts of the New World, I would express my obligation to the Museum of Comparative Zoölogy; to Messrs. C. C. Willoughby and S. J. Guernsey of the Peabody Museum; to Mr. G. S. Miller, Jr., of the U. S. National Museum; Prof. F. B. Loomis of Amherst College; Prof. W. K. Moorehead, of Andover Academy; and Messrs. A. L. Kroeber and E. W. Gifford of the Museum of Anthropology of the University of California.

For interesting photographs of dogs, thanks are gratefully extended to Messrs. Ernest Harold Baynes, W. B. Cabot, C. T. Currelly, W. C. Farrabee, S. J. Guernsey, the Royal Ontario Museum of Archaeology, and the American Genetic Association.

Origin of the Domestic Dog.

The problem of discovering the wild ancestor of the Domestic Dog has engrossed the attention of naturalists from the time of Buffon to the present. Basing their opinion on general external resemblances, the early systematists, Güldenstadt and Pallas, favored the Indian Jackal as the primitive stock whence the European dogs were derived. In this course they have been followed by many later writers, but more exact studies (Miller, 1912) show that the teeth of the Jackal may be distinguished by many minor characters (such as the broadly continuous outer cingulum on m^2 and m^3) from those of the Wolf and Dog. Gidley (1913) has illustrated more fully some of the distinguishing tooth-characters of several canids, including fox, wolf, and coyote, and has grouped them into a key, from which it is seen that domestic dogs and wolves are essentially alike in the cusp-characters and proportions of their teeth, and differ from coyotes and foxes in average characters which though slight, are appreciable on direct comparison. Miller (1912, p. 313) concludes that in a series of dog-skulls "representing such different breeds as the pug, fox-terrier, bloodhound, mastiff, ancient Egyptian, ancient Peruvian, Eskimo (Greenland and Alaska) and American Indian, the teeth are strictly of the wolf type"; and this assertion I can fully endorse from a study of these and other breeds. Nevertheless, though the Wolf and the Domestic Dog are closely related, it does not follow that the latter is directly derived from the former, though even as lately as 1911, Trouessart has upheld the view first put forth by Jeitteles (1877), that the Indian Wolf (*Canis pallipes*) might be the ultimate source of certain breeds of the Dog. Studer (1906) suggests some large Dingo-like type as the lost ancestor; while Noack (1907) supposes that the original stock may have been identical with a small Chinese Wolf of which he possessed two specimens from Tchili, regarded as like the Dingo in color. Nehring (1887) suggests that a small Japanese Wolf (*C. japonicus*) is the living ancestor of the Japanese Street-dog. The Dingo itself is of doubtful origin, and though probably a relatively recent arrival in Australia, may have been brought at the time the Continent was first peopled by man. Krefft (1866) believes he has identified its "first molar tooth. . . .with other fossil remains in the breccia of the Wellington caves," while McCoy (1862) has "identified its bones mingled with those of recent and extinct animals all in one state of preservation in the bone-caverns recently opened beneath the basalt flows at Mount Macedon." In New Zealand, domestic dog-remains of a different breed are found associated with those of the extinct giant rails in the kitchen-middens and presumably came with the Maoris (Hutton, 1898).

The older naturalists maintained the view that cross fertility was a test of specific identity, and recorded many cases in support of the contention that the Dog was fertile with Wolf and Jackal, and that hence it was of such mixed ancestry. Thus, Hunter (1787) recorded the fertile cross between a male Dog and a female of the Wolf and of the Jackal, whence he concluded that all were of one species. A more recent investigator, (Kühn, 1887) records the fertility of Dog-Jackal hybrids when crossed *inter se* or back crossed. In this case a female Finnish Bird-dog was bred to a captive Indian Jackal (*Canis aureus indicus*), producing three litters of four each. All the young were much alike in appearance resembling the Jackal, but were somewhat darker in color. One of the hybrids bred to a Siberian Dog produced seven young. Two other of the original hybrids were paired together, and produced a litter of three young after a period of sixty days' gestation — the normal time for a dog. These young were darker than their parents, with a wash of golden along the sides and on the head, recalling the Jackal's color. Unfortunately no careful study of the cranial and dental characters in the hybrids was made.

The crossing of Wolf and Dog has been frequently accomplished in captivity (Hunter, 1787, 1789). An instance of the fertile crossing of a Siberian Sledge-dog with a female Dingo from Australia is recorded by Eiffe (1909). The North American Indians and the the Eskimo are accredited with tethering female dogs in heat at a distance from camps to obtain crosses with wild wolves, which though usually highly hostile to dogs, will at such times, it is said, hybridize. According to Coues (1873) and others, similar methods were used by the American Indians of the Plains to obtain crosses with wild coyotes. Yet the evidence is not altogether convincing that such cross-breeding was very general, or that it has modified the native dogs in any way. It is noteworthy that the American Indian is not given to the domestication of Wolf or Coyote puppies as might be expected if either were the prototype of his Dogs. Nevertheless Coues (1873) and Packard (1885) on the ground of general external appearance have held that the common Indian Dog of North America was merely a tamed Coyote; and their view has gained wide credence. It may be confidently stated, however, from a study of skulls and teeth, that this is not at all the case. Packard was perhaps influenced by Cope's (1883, p. 242) statement that "many of the domesticated dogs have been derived" from the Wolf and the Coyote, as found in the Pliocene deposits of the Republican River formations. The American Indian dogs, however, are true domestic dogs in skull-characters, and show no evidence of derivation from coyotes.

Crosses between domestic dogs and foxes have been less commonly reported, and even these reports seem to lack proper substantiation in most cases. B. Ross (1861) explicitly states that the dogs of the northern Indians could not be induced to cross with captive foxes. A supposed case is given by Toni (1897) of a natural hybrid, but its ancestry as in one or two other cases, was merely conjectural.

While some naturalists have thus sought to derive the Domestic Dog from Wolf, Jackal, Coyote, or Fox, or from a mixture of two or three of these, others have maintained that it is quite as well entitled to be considered a distinct species with its various artificial breeds. Buffon was one of the first to support this view. Pictet (1853, **1**, p. 203–210) believed that dog-remains from cave-deposits in Europe probably represented the wild ancestor of domestic dogs, and to this wild species he gave the name *Canis familiaris fossilis*. In this he was followed by Bourguignat (1875) who regarded the Prehistoric Dog as a species, related to the Wolf but coexistent with it in a wild state. He applied to it the name *Canis ferus*, and concluded from the relative scarcity of its remains in the earlier strata of human culture, that it was at first seldom domesticated by the early cave-men. Remains of Pliocene canids from central France have been suggested by Boule (1889) as representing the progenitors of the Domestic Dog.

Although the recent and more exact studies of Miller (1912, p. 313) and Gidley (1913, p. 99) have shown that the Domestic Dog may be distinguished by dental characters from Coyote, Jackal, and Fox, its close relationship to the wolves is shown, as they point out, by the shorter and narrower heel of the lower carnassial in proportion to the length and width of the remaining part, the general bluntness and plumpness of the premolar and molar teeth and their cusps, as well as by the shorter and blunter canines. Other less constant but average distinctions are tabulated by the latter author. A noticeable character of the lower tooth-row in Wolf and Dog may also be mentioned, namely, its distinctly outward bend at the junction of the molar and premolar series, whereas in the Coyote and the Jackal, the axis of the tooth-row is much more nearly a straight line. The presence of a minute second posterior cusp in addition to the cingulum in the fourth lower premolar is characteristic of Jackal and Coyote.

The relationship of the Domestic Dog having thus been found to be wholly with the Wolf, and not with Jackal, or Coyote, it remains for future investigation to show what wolf-like ancestor was its wild progenitor. This, however, lies outside the scope of the present paper. Yet it may be said that no evidence has hitherto been adduced that clearly indicates the origin of the Dog from any of the large wolves of circumboreal distribution. In general the skull of the Dog is at once distinguished from that of the Wolf, apart from its usually smaller size, by the higher forehead of the former. That this, however, is due to greater development of the cerebrum through domestication has been suggested by Hammeran (1895), notwithstanding that domestication in case of most animals seems rather to have a stultifying effect. A more diagnostic character is found in the size of the teeth, which even in the largest breeds of dogs are considerably smaller than in the wolves. A fact of probable significance is that in wolves as in the less modified breeds of dogs, *e. g.*, the American Indian dogs, the free posterior border of the palate ends about on a line passing transversely through the middle of the last molar. In the large breeds of European dogs a transverse line at the hinder margin of the palate usually falls considerably behind the last molar, indicating probably that the teeth have retained more nearly their original size relations than have the maxillary and other bones. A like condition is seen also in dogs in which the teeth are abnormally reduced in size, due probably, as in case of the Chinese Chow Dog, to a diet of soft foods as rice and fish through many generations. These facts tend to indicate that the Dog and the large Wolf are really distinct species, and that the wild progenitor of the Dog was a small Wolf of a species distinct from the large wolves of circumboreal distribution. It is natural to look to Asia for this unknown ancestor, and it would be valuable if the studies of Noack and Nehring as to the small wolves of Tchili and Japan might be more fully confirmed. Jentink (1897) suggests the Wild Dog of Java as a representative of the original stock whence the Domestic Dog sprang.

Attention should here be called to the possible effect of domestication in reducing the size and proportions of the Wolf. Apparently the only investigator to compare the skulls of wolves born in captivity with those of wild individuals is Wolfgramm (1894), who states that the skulls of the captive-born wolves are smaller in all proportions, broader and higher, with less developed muscle-crests. The snout is so shortened that pm^4 is forced to assume a transverse position, the lower premolars are imbricate, while in size the carnassial as well as the other teeth are said to be slightly reduced. Wolfgramm concludes that this is sufficient proof that the Dog is derived from the European Wolf, and that its smaller size is a direct result of its domestication. The facts, however, do not warrant such a conclusion. The reduced size of the skull and the crowding of the teeth in captive-born wolves are probably a result of improper nutrition during growth and lack of exercise under confinement, conditions wholly different from the free life of a dog under domestication. The crowding of the premolars is quite as abnormal for a dog as for a wolf, and occurs through failure of the maxillary bones to attain their proper growth, while the teeth themselves attain their size independently.

While some authors have considered that modern dogs are polyphyletic, and would trace the ancestry of the larger breeds to wolves and of the smaller to foxes (Woldrich, 1886a, even suggests the Fennec!), it seems more reasonable to derive them all from a medium-sized dog through selective breeding. Nevertheless it is possible to divide modern breeds into some four to six groups, based mainly on size and minor external characters as erect or lop-ears, drooping or curled-up tail, etc. Cuvier (1808) believed that the French Sheep-dog approached the wild prototype most nearly of all domestic breeds, and considered the Australian Dingo as the most primitive true dog. The characters considered primitive are chiefly the medium size, the erect, wolf-like ears, unshortened snout, drooping and moderately haired tail, and low forehead. The ability to bark is often considered an acquired trait; and the more primitive dogs, such as the Eskimo, howl like wolves more than they bark.

Historic evidence as to the ancestry of the Dog does not carry the matter far enough. The Egyptians had dogs as far back as the records go — certainly four to five thousand years before the Christian era. The same is apparently true of the Chinese, whose history goes back nearly as far. Lortet and Gaillard (1909) recognize four breeds of dogs among the mummified remains from Assiout. Fitzinger (1866) has summarized the ancient history of dogs known from the earliest writings of Rome, Greece, Assyria, and Egypt. Yet it is clear that at the dawn of history, the nations of Europe, Asia, and North Africa had dogs of several breeds, more or less characteristic of each people. Thus the Greyhound type seems especially prevalent in Egypt and is to this day associated with the desert-loving races of Persia and northern Africa.

European archaeologists have made many discoveries of dog-remains in association with bones and implements of prehistoric man, particularly in the caves and old Lake-dwellings of southern Europe. Hitherto at least eleven different Latin names have been applied to as many supposedly distinct prehistoric dogs of Europe. Anutschin (1881) announced the discovery of the first dog-remains to be found in Russia. Parts of fourteen dog-skeletons were found in building the Ladoga Canal, and represent two types which he names respectively *Canis familiaris palustris ladogensis*, and *C. f. inostranzewii.* He considers these to be of the Stone Age, and that the former is closely allied to the Siberian and Northwest American Sledge-dogs — (Eskimo). The latter he thinks very similar to the *C. matris-optimae*, a deerhound-like type, from the Bronze Age, or even earlier (Neolithic, according to Nehring, 1883). Dog-remains, associated with a human skeleton and palaeolithic implements, were described by Studer (1906) as *Canis poutiatini*, and were discovered while digging a street near Gute Bologoïe in Russia. This was as large as a medium-sized Sheep-dog and is believed by this author to be the fore-runner of *C. intermedius* of the Bronze Age, which is possibly a hound.

In the Swiss Lake-dwellings occur skulls of a smaller type of dog named by Rütimeyer *Canis palustris*, a breed characteristic of the later Neolithic and the Bronze Ages, in Europe, 5,000 to 7,000 years ago. Another Neolithic Dog of small size (skull length, 158 mm.) is described by Hué (1906) from Clairvaux, Jura, as *Canis le mirei*, while still another of dwarf proportions, *C. mikii*, is considered by Studer (1906) as a fore-runner of *C. palustris*. The same author (Studer, 1901) sees much resemblance between skulls of *C. palustris* and those of Chow and Spitz. Undoubtedly the Chow is a rather ancient type, in many ways recalling the Eskimo Dog in its erect short ears, broad muzzle, small eyes, bushy mane, and curled-up tail carried stiffly over the hip. Measurements of skulls of Chows given by Studer are slightly larger than those of *C. palustris*.

No less than four breeds of dogs are recognized by Strobel (1880) in human culture layers transitional from the Neolithic to the Bronze Age in Emilia, Italy. One is the small *C. palustris* wide-spread in the Stone Age of Europe; the second is *C. intermedius*, a larger dog supposed to be a hound; the third is the larger *C. matris-optimae*, regarded by Studer (1901) as of the Collie and Sheep-dog (Wolf-dog) type, while the fourth is a Dog smaller than *palustris*, and believed to be of a distinct breed which Strobel names *C. spaletti*. Remains of the first three of these breeds are recognized by Woldrich (1898) from culture layers of middle Neolithic times in caverns of Bohemia.

From these brief accounts of discoveries of prehistoric dogs it is clear that at a very early period of human culture there were at least two or three types under domestication in Europe. It need not be supposed, as some authors have done, that these types are of local origin. Europe, as a peninsula of Asia, probably received its dogs as well as its human population in part at least from the East. Possibly then, as now, certain breeds of dogs were characteristic of different invading tribes.

ORIGIN OF AMERICAN DOGS.

Very little attention has been paid to the dogs of the American Aborigines. At the present day it is probably too late to find pure-bred examples of most of the local varieties that formerly occurred. Barton (1805) was about the only American naturalist to give much thought to the matter, but the few notes he collected were taken mostly at second-hand and were rather indefinite. Coues, Cope, and Packard, as well as many writers following them, considered that the domestic dogs of America must have been derived from the Coyote, or from some other indigenous species of North or South America. Cope was the only one who made an examination of the teeth. In a fragment of a lower jaw from Florida, Cope (1893) made particular note of the absence of the first premolar and remarked on the large size of the metaconid and the entoconid of the lower carnassial. It is true that in a large percentage of American native dogs the first premolar is absent from the lower jaw. A similar anomaly is occasionally seen in wolves and in European dogs, but is rare. It is usually considered that the first premolar in dogs is without a milk predecessor, but though this is often true, it is not always the case. A jaw of a very young dog in the Museum collection, shows very small milk-teeth capping the permanent first premolars which are nearly erupted. A similar case is reported by Lataste (1888). The entire suppression of the first premolar, particularly in the lower jaw, in a large percentage of American dogs, is possibly a retention of the usual early condition, in which there is no first milk premolar.

The important paper of Loomis and Young (1912) and the reports of Nehring on dogs from ancient Peruvian burials comprise most of the work that has been done in the comparative dental and osteological study of American dogs. There are, however, brief notices of the discovery of prehistoric dog-remains and early accounts of certain native dogs by travellers, the more important of which are included in the Bibliography (p. 504–517). Miller (1912) seems to have been the first to show that the teeth of American aboriginal dogs are those of true dogs rather than of coyotes or wolves. This I have verified from a considerable mass of material from North America and Peru, so that there can be no question but that the domestic dogs of both Old and New Worlds are closely related and of common ancestry. It follows that instead of having domesticated various dog- or fox-like species of the American continents, the peoples of the New World must have brought their dogs with them, presumably from Asia, and this probably at a culture stage prior to the domestication of other animals, at least in the North, since no other domestic animal is common to the peoples of both hemispheres. The Asiatic origin of American dogs has previously been suggested by Mercer (1897, p. 126) and Wissler (1917).

The probability therefore is, that the Domestic Dog originated in Asia and was carried by primitive man both east and west into all parts of the inhabited world. That this migration began in late Pleistocene times seems highly probable.

In the Western Hemisphere three types of dogs may in a very general way be distinguished:— (1) the large wolf-like Eskimo Dog of the Arctic countries, strong, powerfully built, with broad muzzle, erect ears, and large bushy tail curled forward over the hip; (2) a smaller type, varying more or less in size and proportions, with erect ears but a drooping tail; and (3) a much smaller type, the size of a terrier, heavy of bone, usually with shortened rostrum as seen among the tribes of the Southwest or again, apparently more slender both in limb and skull as in southern Mexico or parts of South America. South of the Eskimo country, the two latter types of dogs are characteristic, and seem to have occurred together over much of their range, so that travellers often mentioned a "wolf-like" and a "fox-like" dog among the Indians of both North and South America. In this connection, it is interesting to recall Köhler's (1896) statement that in eastern Asia, between the provinces of Gansing and Ussuri, the Chinese have small fox-like dogs, a comparison of which with the small American dogs would be of interest. The smaller American dogs of the slender type (Techichi) seem not very different from the Old World *C. palustris,* and may be not remotely related. The more heavily built small dogs with shortened faces and shorter, stouter limb-bones, are perhaps derived from the more slender type, and possibly owe certain of their peculiarities to cross-breeding with the larger dogs, though this is at present wholly conjectural.

Breeds of American Aboriginal Dogs.

While in a very general way it may be said, that excluding the Eskimo Dog, the American Indians had domestic dogs of two chief types, a larger and a smaller, there were apparently sundry local breeds of these, probably conforming in distribution with the general areas occupied by the groups of tribes amongst which they were found. In the following pages an attempt is made to define such of these breeds as seem to be indicated by the fragmentary accounts of travellers as well as by the study of what skeletal remains have been available. No doubt the number of breeds recognized is subject to revision, for it has been found difficult to determine with any approach to certainty in some cases, what external and skeletal characters are to be associated, and in how far certain supposed breeds are mongrel or relatively pure. Again, the skeletal characters may frequently fail to give any clue to external traits that would be distinctive. Moreover, while the term "breed" is applied to these locally distinct forms of dogs, it is not assumed that the American natives made any conscious effort to change or keep constant the traits of their dogs; possibly some of the variations are merely the result of a certain mongrel mating, going on quite independent of human intent, so that, as in case of the Peruvian Pug-nosed Dog, the variation cropped out only occasionally and may or may not have been purposely preserved.

Nomenclature.— The bestowal of Latin names upon the different breeds of dogs recognized has here been purposely avoided, as it seems unwise to extend to such artificial variations the systematic recognition accorded natural species and subspecies. Nevertheless, Latin names or Greek letters have been used by other writers to indicate domestic breeds, and such names have been applied in many ways: — as trinomials, quadrinomials, or quinquenomials; sometimes separated from the binomial, *Canis familiaris*, by a comma or the abbreviation "var.," or otherwise used in such a way as to cause doubt as to their technical standing in systematic nomenclature. Some names of dogs have been erected in a strictly binomial fashion and if accorded standing, conflict with other names. Thus Rütimeyer's *Canis palustris* (1863) of the Lake-dwellings is preoccupied by von Meyer's *Canis* (= *Galecynus*) *palustris* (1843). The name *Canis mexicanus* currently used for the Mexican Wolf proves to apply to the Mexican Hairless Dog only. Hodgson's *Canis laniger* (1845) for a Thibetan Wolf is preoccupied by Hamilton Smith's *Canis laniger* (1840) for the Nootka Sound Dog. Other cases might be added. The practice of using standard English (or vulgar) names for all artificial breeds is therefore to be recommended. With the descriptions following, a list of Latin names applied by previous writers is given under each breed.

ESKIMO DOG.

Plate 1, fig. 1.

1817. *Canis familiaris sibiricus groenlandicus* Walther, Hund, p. 27 (*fide* Fitzinger; not *Canis groenlandicus* Bechstein, 1799, *q. v.* Alopex).

1820. *C. f.* var. n. *borealis* Desmarest, Mamm., **1**, p. 194.

1840. *Canis borealis* Hamilton Smith, Jardine's Nat. library. Mammalia, **10**, p. 127, pl. 2.

Characters.— Size large, appearance wolf-like, but with less oblique eyes, less attenuated muzzle, and more elevated forehead; tall usually carried curled forward over the hip: teeth much smaller than those of the Wolf. Pelage thick, with a shorter under fur overlaid with longer hair which on the shoulders may be as much as eight inches long; tail bushy. Color whitish, more or less clouded on the back, with dusky, or varying to black, or black and white, or rarely tan and white.

Distribution.— The Eskimo Dog was originally found in Arctic America coextensively with the Eskimo tribes from the barrens of Alaska to Labrador, chiefly along the coast. In the east it was probably at its southern limit on the east coast of Newfoundland, and thence ranged northward, accompanying its Eskimo masters, to Smith Sound, Greenland. In Greenland it formerly was found along the west coast southward, with the natives, but the present-day sledge-dogs of the Danish settlements are probably largely mongrel, through interbreeding with dogs introduced from Europe (Brown, 1875); and the same is true of those in Alaska and southern Labrador.

External Measurements.— An Eskimo Dog brought back by Parry, on his first voyage, is figured by Children (1827) who gives its dimensions as follows: —

Length, occiput to root of tail	28	inches	about	71	cm.
" " " end of nose	11	"	"	28	"
" of tail (about)	18	"	"	45.7	"
Total length (therefore about)	57	"	"	145	"
Length of ear	3	"	"	7.7	"
Eyes to point of nose	4	"	"	10	"
Standing height at shoulder	24	"	"	61	"

These figures do not indicate a very large animal. The very thick coat, especially on the shoulders, gives an increased appearance of size not well borne out by skeletal measurements. It should be kept in mind, that since the advent of Europeans, much attention has been given to increasing the size and strength of these northern dogs for draught purposes. It is likely that the large wolf-like Eskimo Dogs now common in the North, are considerably different from the original stock found by the early Arctic explorers.

Figures. Children, J. G. Zool. journ., 1827, **3**, pl. 1. From Parry's first voyage.

Audubon, J. J. and Bachman, J. Quadrupeds of North America, 1848, **3**, pl. 113. Zoölogical Gardens, London.

Smith, C. Hamilton. Jardine's Nat. library. Mammalia, 1840, **10**, pl. 2. Prince's Street Gardens, Edinburgh.

Cranial Characters.— Among the various skulls of so-called Eskimo Dogs examined, there is more or less disparity of size. This is no doubt an indication of the extensive crossing with European dogs that has been carried on for a long period with a view to improving the speed and strength for which this dog is useful. Skulls from eastern Kamtschatka are small, others from Alaska and Mackenzie are of superior size. It is therefore difficult at the outset to determine what the original Eskimo Dog of North America was really like. It is notable, however, that the teeth, even of the largest skulls are not much larger than those of medium-sized skulls, while in no case do they approach the magnitude of the Wolf's teeth. It would be of the utmost interest, in this connection, to compare the teeth of a known hybrid between the Eskimo Dog and a Wolf. Yet in spite of the frequency with which this cross is said to occur, there seem to be few skulls available. Windle and Humphreys (1890, p. 9) give the ratios of different parts of such a skull to the basicranial axis.

For lack of a more authentic standard, I have taken as typical of the Eskimo Dog, portions of a skull (M. C. Z. 10,537–10,539) exhumed by Dr. M. P. Porsild from an old village site at Sermermiut, west Greenland. While not of great size, this skull is notable for its broad palate, rather prominent trough-like depression between the frontals, and the high strong sagittal crest, yet is the surface of the brain-case comparatively smooth. Nearly similar is the skull of an Eskimo Dog from Hebron, Labrador, collected in 1897. Its wide palate and stout teeth are particularly noticeable as well as its strongly developed crests and broad forehead.

Measurements of the Skulls	M. C. Z. 10,538 Greenland	M. C. Z. 7,406 Labrador	U. S. N. M. 83,869 Baffin Land
Upper tooth-row, alveolus of i^1 to m^2	96	105	96
" " " " c to m^2	81	87	79
" " " " p^1 to m^2	68	66	66
" " " " p^2 to m^2	62	59	58
" " " " m^1 to m^2	19	19.5	19
Length of carnassial, p^4	19.5	21	21
Width of palate outside m^1	75	75	69
Palatal length, alveolus of i^1 to median edge	98	?	94
Lower jaw, alveolus of i_1 to m_3	97	105	—
" " " " c to m_3	89	99	—
" " " " p_1 to m_3	—	—	—
" " " " p_2 to m_3	72	74	—
" " " " p_3 to m_3	61	62	—
" " " " p_4 to m_3	50	49	—
" " " " m_1 to m_3	37	37	—
Length of carnassial, m_1	22	23.6	—
Width across postorbital processes	64—	52	52
" " zygomata	125	—	—
" " occipital condyles	45	49	43

Nathusius (1874) reports on ten skulls found near old Eskimo huts in Jackson and Sabine Islands, Greenland. The largest of these had a basal length of 189 mm., the smallest 175 mm. In skull U. S. N. M. 83,869 the basal length is 170 mm., the condylobasal length 180 mm., which may be the same dimension as the "basal length" of Nathusius.

In a series of nine skulls of Eskimo Dogs from Greenland, Baffin Land, Labrador, Mackenzie, Alaska, eastern Siberia and Kamtschatka, collected for the most part many years ago, it is notable that most are of about the same size as those of the Common Indian Dog. One or two from eastern Siberia are the smallest and most slender. All are heavy of bone, yet the sagittal crest does not show the strong backward overhang seen in the Wolf's skull. The muzzle in most is broad, yet this varies. The largest skull of all (U. S. N. M. 8,222) collected by Dr. W. H. Dall at Nulato, Alaska, is nearly as long as a small Wolf's, yet the teeth do not approach those of a Wolf in size. This and other large skulls of Eskimo Dogs, probably are the result of crossing with large dogs of European origin. Hearne (1796) speaks of the large English dogs at the Fort on Hudson Bay; Ross (1861) notes the crossing of Eskimo Dogs with imported Pointers; and Harmon (1820) records that by the early part of the last century, large dogs imported from the English settlements of Newfoundland, had already been introduced in the fur countries as far west as the Rocky Mountains. It seems apparent that the large size of some present-day Eskimo Dogs is therefore due to the influence of imported stock, and that probably the aboriginal Eskimo Dog was not a much larger animal than the Common Indian Dog. The thick coat, however, often adds much to its apparent size.

It seems to be somewhat characteristic of the Eskimo Dog that the posterior narial opening (interpterygoid fossa) is broader and shallower, less contracted at its rearmost portion, than in dogs of other breeds, possibly correlated with their use in hauling and consequent need for deeper breathing. In this respect, however, there is some variation; yet in certain larger skulls which are presumably of mongrel dogs, the more narrowed and deepened fossa is obvious.

Thorndike (1911), in an interesting article on the Indian sled-dogs of North America, doubts if pure-blooded Eskimo or "Husky" Dogs are today found in North America except possibly about the Coppermine River, Banks Land and Wollaston Land. "In general, the Eskimo Dog differs from the Indian variety in being more wolfish and in having less European strain. His tail is more bushy and he is cleaner-legged. His ears are more erect and pointed, while his body is larger in size"— this in comparison with the mongrel dogs of the northern forest Indians of the present day.

Origin.— From its evident similarity of appearance to the Siberian Sledge-Dog, it is generally accepted that the two are of similar origin. The Siberian Dog seems indeed to differ in little except possibly its slightly smaller size. Dogs of the same type are found across northern Asia into Lapland, whence certain authors have concluded that the Eskimo Dog was undoubtedly brought from the Old World by the Eskimo themselves, who must already have known how to use them in harness. This view seems on the whole very probable. The ultimate derivation of the Eskimo Dog and the so-called Spitz Dogs in general, is however, still obscure. Some form of Wolf is commonly looked to as the remote ancestor of the breed though direct proof is not available. Holland (1908, p. 232) has even gone so far as to suggest that certain well-preserved jaws discovered in a Pleistocene cave-deposit at Frankstown, Pennsylvania, may from their resemblance to those of an Eskimo Dog, have come from a wolf-like ancestor of this breed. The associated fauna, however, is of a more southern character than would be expected as companions of this Arctic dog.

Of the larger dogs of the New World, the Eskimo Dog is the only one that habitually carries its tail curled forward over the hip. This character, striking as it is, does not seem to have been particularly studied from the standpoint of heritability, to see if it behaves as a Mendelian character when contrasted with a drooping tail. Yet it is a highly important trait, and is found not only among the dogs of similar appearance in the north of Asia and Europe, but in other varieties, possibly related, and of more southern habitat in those continents. The so-called Chow Dog of China, a medium-sized red, or sometimes black (Kreyenberg, 1910) dog, with erect ears and powerful shoulders has the same sort of tail. A similar, though slightly smaller dog standing 50 cm. high at the shoulder is found among the Battaks of Sumatra (Studer, 1901, p. 31). The same curled tail is found in the Pomeranian Dogs, that appear in the decoration of Greek vases (Keller, 1909) or as figurines of Mycenian times. The fact that the curled tail carried over the hip is so widely characteristic of certain breeds of Old World dogs, where it seems to have been known from ancient times, implies that it originated there and strengthens the view that the Eskimo Dog came from Asia with the Eskimo. The contention that "the canine of the American aborigine, or Amerind, was simply a tame wolf, differing from its wild brother in the qualities that would naturally follow breeding in the semi-domestication of the savage" and that the dog "bred by the Indians in the forest regions, and the Eskimos, was always derived from the Gray wolf" (Thorndike, 1911), seems only remotely true. There is much evidence, though of a somewhat uncertain character, that wild male Wolves will breed with female Eskimo Dogs at proper seasons, and the northern Indians are said to encourage such occasional crosses. Thorndike states that tame wolves are sometimes seen in harness with the dogs in the North. Nevertheless, under usual circumstances, those who have lived in Arctic countries agree that wolves are highly unfriendly with the dogs, and a single wolf is more than a match for several dogs. There seems to be no evidence that Wolf cubs were habitually reared by either Eskimo or Indian, which one would expect to be the custom if the Eskimo Dog is merely a Wolf, tamed. Hearne (1796) mentions that some Indians, on finding a Wolf's den, fondled the little cubs, and painted their faces with vermilion, but returned them to the den and made no attempt to rear them. He adds (p. 362) that "all the wolves in Hudson's Bay are very shy of the human race, yet when sharp set, they frequently follow the Indians for several days, but always keep at a distance. They are great enemies to the Indian dogs, and frequently kill and eat those that are heavily loaded, and cannot keep up with the main body."

A comparison of available skulls indicates that those of Eskimo Dogs from eastern Labrador and western Greenland are constantly smaller than those of eastern wolves, the teeth markedly smaller. European investigators (Studer, 1901; Anutschin, 1881; Woldrich, 1882) have described skulls and other bones of large dogs from deposits of the later Stone Age — Neolithic — one or two of which, the so-called *C. f. inostranzewi*, *C. f. ladogensis*, seem to be large animals much like Eskimo Dogs, and are considered as belonging to the same group.

Eiffe (1909) records a crossing of the Australian Dingo with an Eskimo Dog, in the Hamburg Zoölogical Gardens. The Dingo, a female, was an unusually pale reddish brown animal; the dog, a black East Siberian Sledge-Dog. The eight pups of this litter were more reddish in color than their mother, with slightly bushy tails, somewhat bowed upward. The old Dingo then paired with one of these reddish dogs, and produced eight young, five very pale like herself, three darker red. The ears of all the young were not at first erect, but became so in the course of five months.

Notes.— The accounts of the early voyagers leave no doubt that these large dogs were companions of the Greenlanders and American Eskimo before the coming of Europeans. Their use by the natives as sledge-animals makes them of prime importance in the Arctic conditions under which they live. Cranz and Egede, early Danish missionaries to Greenland, mention the dog-teams, and the latter author gives a crude figure. Scoresby in his Greenland Journal, (1823, p. 203) relates finding at Jameson's Land in eastern Greenland, the skull of a dog in a small grave, probably that of a child. The Eskimo of this part of Greenland must have had very little contact with Europeans up to that time. Cranz, in his History of Greenland, alludes to this custom of the natives, who believe that by laying the head of a dog beside the child's grave, the animal will show the ignorant babe the way to the Land of Souls, for a dog can find its way everywhere.

Among early accounts of the Eskimo Dogs, several of special interest are given in Hakluyt's Voyages. In The second voyage of Master Martin Frobisher, made to the West and Northwest regions, in the yeere 1577 (Hakluyt's' Voyages. Everyman's Library ed., **5**, p. 137), it is related that a landing party at York Sound examined the deserted tents of the Eskimos, "not taking any thing of theirs except one dogge." The possessions of these people are described, including "also dogges like unto woolves, but for the most part black, with other trifles, more to be wondred at for their strangenesse, then for any other commoditie needefull for our use." Again, "they frank or keepe certaine dogs not much unlike Wolves, which they yoke togither, as we do oxen & horses, to a sled or traile: and so carry their necessaries over the yce and snow from place to place: as the captive, whom we have, made perfect signes. And when those dogs are not apt for the same use: or when with hunger they are constrained for lacke of other victuals, they eate them: so that they are as needfull for them in respect of their bignesse, as our oxen are for us." At Leicester's Island, in the present Frobisher Bay, a captive Eskimo caught one of the Englishmen's dogs and showed how the natives trained their animals. In the narrator's words, "Taking in his hand one of those countrey bridles, he caught one of our dogges and hampred him handsomely therein, as we doe our horses, and with a whip in his hand, he taught the dogge to drawe in a sled as we doe horses in a coach, setting himselfe thereupon like a guide: so that we might see they use dogges for that purpose that we do our horses. . . . They drawe with dogges in sleads upon the yce, and remoove their tents therewithall wherein they dwell in Sommer." This seems to be the earliest account of Eskimo Dogs in Arctic America by Englishmen. It is interesting to find that the explorers carried a dog with them from Europe, showing the possibility at an early date, of contamination of the breed with European dogs. John Davis, who sailed from England in June, 1585, "for the discoverie of the Northwest passage," met with Eskimo Dogs in August, in Cumberland Sound. His chronicler relates that here "we heard dogs houle on the shoare, which we thought had bene volves, and therefore went on shoare to kill them. When we came on land the dogges came presently to our boat very gently, yet we thought they came to pray upon us, and therefore we shot at them, and killed two: and about the necke of one of them we found a leatherne coller, whereupon we thought them to be tame dogs. There were twenty dogs like mastives with prickt eares and long bush tailes" (Hakluyt's Voyages, Everyman's Library ed., 5, p. 289).

At the present day, it is unusual to see typical Eskimo Dogs south of Hamilton Inlet on the Labrador east coast, though many mongrel individuals are found about the settlements between there and Newfoundland. Three centuries ago, however, the natives of the latter island had dogs which from their apparent resemblance to wolves, may have been of the Eskimo breed. For Whitbourne, in his "Discourse and Discovery of Newfoundland" (London, 1622) writes that the natives of Newfoundland "are a people that will seeke to revenge any wrongs done unto them or their Woolves, as hath often appeared. For they mark their Woolves in the eares with several markes, as is used here in England on Sheepe and other beasts, which hath been likewise well approved. For the Woolves in these parts are not so violent and devouring as Woolves are in other Countries." The same writer speaks with astonishment of his own mastiff's familiarity with these tamed "Woolves" (Mercer, 1897), which it seems reasonable to conclude were really Eskimo Dogs.

Of the Eskimo Dog in Greenland, Brown (1868, 1875) considers the breed to be practically the same as that of Davis Straits and Kamtschatka. In western or Danish Greenland he found it more or less mixed with dogs of European descent and south of Holsteensborg not used by the Eskimo, as the sea is not sufficiently frozen over in winter for sledging. The same author adds that in 1861, Prof. Otto Torell brought several dogs from Greenland for the use of his expedition in Spitzbergen, where on account of the open water they were found useless and set free. Within a few years they were said to have increased in numbers.

PLAINS-INDIAN DOG.

Characters.— Size medium, slightly smaller than the Eskimo Dog; ears large, erect; tail drooping or slightly upcurved; coat rather rough, usually "ochreous tawny" or "whitish tawny," or sometimes black and gray, mixed with white.

Distribution.— Western North America from British Columbia south perhaps to the Mexican Boundary and eastward through the Great Plains Region.

Notes and Descriptions.— It is apparently to this dog that most of Lord's description (1866, **2**, p. 222) applies in his Naturalist in Vancouver Island and British Columbia. So impressed was he by the general similarity of these dogs to coyotes, that he believed the one derived from the other, and makes one general description do for both, with the addition that in the dog the hair "becomes shorter, softer, and more uniform in coloration, although the tail retains its bushy appearance." The general color is an "ochreous grey," the hairs tipped with black, those of the neck tricolored, having their "lower two-thirds reddish brown; then a ring of white, and a black tip." This pattern gives "a most curious speckled look" to the bristling neck of an enraged dog. Coues (1873) was equally impressed by the general resemblance of these dogs of the Plains Indians to coyotes and considered the two animals essentially the same in structural points, though he thought it "unnecessary to compare the skulls." Indeed, he accepted it as unquestionable that in every Indian community mongrel dogs are found, shading into coyotes in every degree. Such crosses he says, are obtained by picketing female dogs over night at proper times, thus allowing them to cross with coyotes. Morton (1851) quoting a letter from Dr. Cooper, Fort Duncan, Texas, speaks of every ranch having a dog resembling a coyote, "and a bitch to which no dog had had access, produced whelps, evidently a cross with the *Coyote*." Wortman, also (in Cope and Wortman, 1884, p. 8, footnote) after extended travel in the western United States corroborates Coues — but from hearsay evidence, however. He found among the Umatillas, Bannocks, Shoshones, Crows, Arrapahoes, and Sioux, mongrel dogs, "which to one familiar with the color, physiognomy and habits of the coyote, have every appearance of blood relationship," if they are not "in many cases, this animal itself in a state of semi-domestication." All such evidence, however, is unsatisfactory, and rests on general resemblances in form, color, and characteristics that may be common to both animals. A comparison of skulls and teeth would perhaps reveal more significant tokens of the true relationship, but hitherto nothing has been published as to the cranial characters of such animals. Yet, in his much-quoted paper on the origin of the American varieties of the dog, Packard (1885) appears to have been influenced by Coues's belief, and agrees with him in considering these dogs as merely tamed coyotes. In a journey through provincial Mexico he was struck by the general resemblance of the native dogs to these animals, and again, in 1877, on the upper Missouri took special note of the dogs of the Crow Indians, describing them as of wolf-like appearance, of the size and color of a coyote — a whitish tawny — but less hairy and with less bushy tails. Lord (1866, 2, p. 221) found a number of dogs with a little tribe of Indians at Sweltza, a small lake west of the Cascades, near which the boundary of British Columbia passes, "that were hardly in any degree altered from the cayote" in exterior appearance. He speaks of their burrowing deeply into the ground to bring forth their young, but this trait is found in dogs as well as in coyotes. From these accounts it is clear that the general appearance and coloration of this dog are strikingly like those of one of the coyotes. Hamilton Smith (1840, p. 156) refers to the same dog as the "*Techichi* of Mexico, or the Carrier-dog of the Indians," and gives a figure (Pl. 4) of the only example he had seen, a tawny dog of normal proportions and with cropped ears. He confuses it however, with Richardson's "Carrier-Indian" or Short-legged Dog and further complicates his account by supposing it the same as the Mexican Techichi.

James Teit (1909) writing of the Thompson Indians of the upper Fraser River, British Columbia, also remarks on the general resemblance of their dogs to coyotes, but adds that through intercrossing with dogs imported by the whites, the breed has become totally extinct. They were good hunters, though poor watch-dogs, and the best ones for deer hunting were highly prized. Such dogs generally ran the deer to water, often bringing it to bay in some creek, and keeping it there till the Indian came up and dispatched it.

It is regrettable that more thorough comparison of the teeth of these dogs could not be made to test any supposed resemblance or relationship to coyotes. As Gidley (1913) has pointed out, the fourth lower premolar of the latter has normally *two* secondary cusps and a cingulum, that of the dog normally but *one* secondary cusp, a ready means of distinction in addition to other relative characters. It should be added that in numerous fragments I have examined from the southwest, there is no evidence of coyote influence.

Referable to this same breed are perhaps the *larger* dogs mentioned by Suckley (Suckley and Gibbs, 1860, p. 112) as kept by the Indians "about the Dalles of the Columbia," Oregon. These he describes as about the size of a foxhound, but much more slender, in color yellow or brindled.

A similar type of dog seems to have been kept by the Indians of California. At all events, a series of skulls from mounds on the southern coastal islands are hardly to be distinguished from New Mexican skulls. A skull found in association with that of an Indian, washed out after a freshet, from a bank at the junction of the Tuolumne and San Joaquin Rivers, California, is of the same medium-sized type, rather heavy of bone, slender of muzzle, and with feeble sagittal crest, mainly on the occiput.

Skeletal Measurements.— A cranium discovered in the course of excavations by Dr. A. V. Kidder at Pecos, New Mexico, may be attributed to this dog. It is nearly identical in size and proportions with several of the skulls from southern California from mounds on the island of San Nicolas, kindly loaned me by the Archaeological

Department of the University of California. These last are in an excellent state of preservation, of medium size, yet of massive bone, with roughened brain-case, and sagittal crest developed mainly on the interparietal region. The teeth are rather small, the first upper premolar lacking in some cases.

The following table gives the cranial measurements of several of these skulls. The first two, from Pecos, N. Mex., differ in that the one, a rostrum only, is considerably larger than the other, or any of the Californian skulls. Of the latter, there are several from mounds on San Nicolas Island, which represent a dog apparently identical with that of New Mexico. The last two columns give dimensions of two old dogs with much worn teeth; in the larger, indeed, the upper molars have been lost and their alveoli partially filled, while the remaining teeth are mere stumps. The smaller of these two skulls, while not very different in the measurements of the tooth-row, has a shorter, smaller cranium. It is very likely a mongrel between this larger dog and one of the short-nosed dogs ('Pachycyon'), a relationship further indicated by its slightly more upturned snout. It is further peculiar in lacking the first upper premolars on both sides, while in the lower jaw there are on both sides *four* molars, the second and third each with two roots and the fourth single-rooted like the usual third molar. Four molars in the lower jaw is not an unknown feature in the dog. Nehring (1882) found twenty dog skulls out of 650 in which there was an extra molar either in both upper or both lower tooth-rows, or in only one tooth-row.

Lucas (1897) has given a brief account of the cranium of a large dog, evidently domesticated, found in an ancient Pueblo Indian grave at Chaves Pass, Arizona, in 1896. Another of similar proportions was discovered at San Marcos, Texas, associated with flints, a human skeleton, and other bones. The former skull he regards as of a "broad-faced type," and describes it as "precisely similar in size and proportions to the cranium of an Eskimo dog from Cumberland Sound." He supposes these to be carrier-dogs, and recalls Clavigero's mention of them as "a quadruped of the country of Cibola [New Mexico], similar in form to a mastiff, which the Indians employ to carry burdens." I have not been able to examine these skulls, but they may be the same as the larger of the two New Mexico skulls here listed.

Measurements of the Skulls	N. Mex.: Pecos M. C. Z. 9,523	N. Mex.: Pecos M. C. Z. 9,522	Cal.: Stanislaus Co. U. C. 2,430	Cal.: S. Nicolas Id. U. C. 16,349	Cal.: S. Nicolas Id. U. C. 16,351	Cal.: S. Nicolas Id. U. C. 16,348	Cal.: S. Nicolas Id U. C. 16,350
Occipitonasal length (excluding incisors)	—	173	170	164	172	178	159
Basal length	—	153	151	146	153	156	143
Palatal length	91	82	85	81	81	88	81
Median length of nasals	—	49	54	—	49	54	50
Alveolus of i^1 to anterior edge of orbit	82	74	73	67	72	72	68
Alveolus of i^1 to m^2	95	86.5	89	86	88	91.5	85
" " canine to m^2	77	71	74	69	72	75	70
" " p^1 to m^2	65	59.5	60	57	58	59	—
" " p^2 to m^2	57	53	56	50	52	55	51
" " p^3 to m^2	46	42	45	40	42	—	41
" " p^4 to m^2	34	33	34	30	32	32	31
Alveoli of m^1 and m^2	18	17	18	16.5	19	17	16.5
Length of carnassial (p^4)	19	18	20	19	17.5	—	17
Width of occipital condyles	—	33	34	31	33	36	33
" " palate at m^1	64	60	59	61	66	67	57
" across supraorbital processes	—	47	43	55	53	54	46
Zygomatic width	—	—	97	106	112	111	97
Lower jaw, alveolus of i_1 to m_3	—	—	—	—	89	92	87
" " " " canine to m_3	—	—	—	—	80	85	79
Lower jaw, alveolus of p^1 to m_3	—	—	—	—	65	67	64
" " " " p_2 to m_3	—	—	—	—	62	63	61
" " " " p_3 to m_3	—	—	—	—	53	55	52
" " " " m_1 to m_3	—	—	—	—	34	34	33
Length of m_1 (carnassial)	—	—	—	—	21	20	21

Uses.— These dogs of medium size, were chiefly used by the Indians in transportation, secondarily in hunting. In the plains country from Saskatchewan to the Mexican Boundary, the *travois* was in general use. This consisted of two light poles, the smaller ends fastened together and resting on the dog's shoulders, the heavier ends kept apart by a crosspiece and trailing behind. A leather collar served to keep this frame in place for dragging the goods piled upon it. In this way entire villages moved, the dogs dragging the household effects. The contrivance seems not to have been used west of the Rocky Mountains. Perhaps the earliest mention of the use of these dogs as pack-animals is found in Coronado's account of his journey in 1540 to 1542, from the City of Mexico to the Texas plains (see translation by Winship, G. P., 1904). When some ten days' march from the present Rio Pecos, Texas, Coronado and his followers came to Haxa, where the natives were found to have "packs of dogs." In moving camp, these Indians started off "with a lot of dogs which dragged their possessions." "They travel like the Arabs, with their tents and troops of dogs loaded with poles and having Moorish pack saddles with girths. When the load gets disarranged, the dogs howl, calling some one to fix them right." A letter from one of Coronado's men further describes the dogs. "These people," he writes, "have dogs like those in this country [Spain], except that they are somewhat larger, and they load these dogs like beasts of burden, and make saddles for them like our pack saddles, and they fasten them with their leather thongs, and these make their backs sore on the withers like pack animals. . . . When they move — for these Indians are not settled in one place, since they travel wherever the cows [*i. e.*, Bison] move, to support themselves, these dogs carry their houses, and they have the sticks of their houses dragging along tied on to the pack saddles, besides the load which they carry on top, and the load may be, according to the dog, from 35 to 50 pounds." Evidently these were the carrier-dogs of the Plains Indians, and the method of packing with the tent poles used as *travois* seems to be here first described.

As pack-animals, for moving camp in their pursuit of the Bison, these dogs were of great service to the Indians of the plains country, and every village was provided with troops of them.

As an article of food, the dog seems to have been somewhat analogous to the fatted calf. George Catlin (1841, **1**, p. 14) writing of the Upper Missouri Indians, says: "We are invited by the savages to feasts of *dog's meat*, as the most honourable food that can be presented to a stranger."

SIOUX DOG.

Characters.— A large wolf-like dog, probably closely related to the Plains-Indian Dog but larger and gray rather than tawny in color.

Distribution.— Probably the north-central plains area, from the Missouri north perhaps to Saskatchewan.

Notes.— No doubt the carrier-dogs differed slightly among the various tribes of Plains Indians covering the wide stretch of country from Northern Mexico to Saskatchewan, so that local breeds of the general type could be distinguished did we have opportunity to compare them. Morton (1851), who tried to obtain information from frontier officers in the earlier half of the last century, quotes a letter from H. H. Sibley, a correspondent in Minnesota, who avers that "the Indian Dog differs much in size and appearance among different tribes" but that they all have small, sharp, erect ears. He particularly recalls that "among the Sioux, it is large and gray, resembling the Buffalo Wolf." Packard (1885) has mentioned "whitish tawny" Indian dogs seen in 1877, among the Crows of the upper Missouri. Lewis and Clark, on their famous journey, came upon a scaffold burial of an Indian squaw, near which lay two dog-sleds and the carcase of a *large* dead dog, between Mandan and the Yellowstone. These large gray dogs of the Sioux may have been a distinct breed from the tawny dog, of the size of a Coyote, and possibly the same as certain large dogs seen by Hind (1859) among the Crees of the Sand Hills. Sir John Franklin (in his Journey to the shores of the Polar Sea, 1829, **1**, p. 176) briefly mentions the large dogs of the Crees in the Saskatchewan country. He adds that in the month of March, the female wolves "frequently entice the domestic dog from the forts, although at other seasons a strong antipathy seemed to subsist between them."

Hamilton Smith (1840) quotes an interesting letter from Prince Maximilian of Wied, likening the North American plains dog to a wolf, "excepting that the tail is more curved, and the color either "absolutely grey like wolves" or white, black, and black and white spotted. The latter coloring, however, may apply to some other breeds than that under consideration.

Figures probably representing this dog, are shown in some of the plates of Catlin's Indians (1841, colored edition, **2**) small to be sure, but showing the gray coloring, large erect ears, and scimitar-shaped tail carried out behind. His Plate 103 in **2** is a spirited drawing illustrating a dog-fight in which all the dogs of the party, though burdened with their loads "*en travois*," are rushing to participate.

Long-haired Pueblo Dog.

Characters.— A medium-sized dog of slender muzzle, erect ears, and normal bushy tail. Hair long and dense, pale yellowish, clouded with dark brown on ears and crown, whitish beneath on throat, belly, and feet. Feet well-haired. Probably this is to be looked upon as a local breed of the Plains-Indian Dog, from which it apparently differs only in its longer coat.

Distribution.— Known only from the Marsh Pass region of Arizona, but in former times probably common to the Pueblo tribes of Arizona and New Mexico.

General Account.— One of the remarkable discoveries of Messrs. Guernsey and Kidder, while exploring for the Peabody Museum, was an excellently preserved specimen of a medium-sized dog associated with a human burial. In the arid climate of Arizona, the dog had merely dried, so that the entire animal even to the thick hair was nearly intact. It is covered with a dense coat of long woolly hair, of a pale yellowish color, clouded on the back and head with brownish. On the sides of the body, the length of the hair is about 100 mm.; on the toes 30 mm. The culture period to which this specimen belongs, is believed by Mr. Guernsey to antedate that of the Cliff Dwellers, and hence must be at least several centuries old.

It seems probable that it was to this long-haired dog that Mendoza, a companion of Coronado, refers in a letter of 17 April, 1540, to the King of Spain, describing the pueblo of Cibola, then a famous Indian site, near the present town of Zuñi, New Mexico. This letter is translated by Winship (1904, p. 153) from the Spanish of Pacheco y Cardenas, (Documentos de Indias, **2**, p. 356), and contains the following passage:— "In their houses they keep some hairy animals, like the large Spanish hounds, which they shear, and they make long colored wigs from the hair, like this one which I send to Your Lordship, which they wear, and they also put this same stuff into the cloth which they make." These "hairy animals, like the large Spanish hounds," seem probably, in the light of Mr. Guernsey's discovery, to have been the same as the dog found at Marsh Pass. It is recalled here that breeds of long-haired dogs were kept for shearing not only by the Indians of Puget Sound, but by the Chonos of the Taitao Archipelago, Chile, and their hair woven into blankets (see p. 475). There was formerly a breed of long-haired white or brown dogs among the aboriginal inhabitants of New Zealand, the product of which was similarly used (Colenso, 1878).

External Measurements.— It is not possible to remove the skull and limb-bones without injuring the mummy for exhibition purposes. A few dimensions, however, follow:—

Length from nose to root of tail, following backbone — about	700 mm.
Length of tail, (broken at tip) slightly over	200
Hind foot	141
Femur (approximately)	145
Tibia (approximately)	143
Upper jaw, front of canine to back of pm^4	55.5
Upper carnassial (pm^4)	18
Length of skull from occiput to tip of nose (approximately)	195
Width outside upper canines	31
" " carnassials	54
Zygomatic width — about	95
Lower jaw, front of canine to back of m_1	68.5
" " " " " " " " p_4	49
" " pm_1 to pm_4	35
Length of lower carnassial	21

LARGER OR COMMON INDIAN DOG.

Plates 7, 8.

1817. *Canis familiaris americanus canadensis* Walther, Hund, p. 43.

1829. *Canis familiaris* var. c. *canadensis* Richardson, Fauna Boreali-Amer., **1**, p. 80 (not *Canis lupus canadensis* Blainville 1841, which is *Canis lycaon* Schreber).

1834–6. *Canis canadensis* Reichenbach, Regn. anim., pt. 1, p. 46, fig. 564.

—— *Canis familiaris orthotus canadensis* Reichenbach, Naturg. raubth., p. 146, fig. 564.

1867. *Canis domesticus borealis luparius* Fitzinger, Sitzb. K. akad. wiss. Wien, **56**, pt. 1, p. 409 (not *C. f. orthotus luparius* Reichenbach, Regne anim., pt. 1, p. 13, fig. 131; not *Canis domesticus luparius* Fitzinger, Sitzb. K. akad. wiss. Wien, 1866, **54**, pt. 1, p. 406; 1867, **56**, pt. 1, p. 396.

1881. *Canis latrans domesticus* Langdon, Journ. Cinc. soc. nat. hist., **3**, p. 299 (not *Canis familiaris domesticus* Linné, 1766).

Characters.— This was probably closely related to the Plains-Indian Dog, but seems to have been usually solid black or black and white in patches instead of resembling the Coyote in color. The skull has, when adult, a knife-like sagittal crest, a high forehead, and is rather slender. Limbs much longer than in the Short-legged Indian Dog yet slightly inferior to those of a Greyhound. The first lower premolar was frequently wanting.

Distribution.— Dogs of this general type, agreeing fairly well in size and proportions were found among the forest Indians from Alaska southward to Florida and the Greater Antilles, and westward to the edge of the plains in the east central States. The more northern dogs seem to average a little larger than those from the south, but in the absence of more exact knowledge seem best referred to this type. No doubt in the far Northwest there was more or less mixture with the Eskimo Dog. Probably too, local strains of this general type of dog could be distinguished, did we know their external characteristics, but the skulls and teeth seem remarkably similar over a wide area.

Skeletal remains.— Cope (1893) was the first to describe the jaw of this dog from a specimen collected by Moore from a shell-mound on St. John's River, Florida. He was struck by the fact that the first lower premolar was missing and appeared not to have developed. The strong development of the entoconid of the carnassial, he also noticed. Moore, in the course of various explorations in Florida and Georgia discovered many remains of dogs, apparently of this type. In a large mound on Ossabaw Island, Georgia, he (1897) found several interments of human and dog-skeletons, the latter always buried separately and entire, showing that the dogs had not been used as food. Other dog-skeletons of a similar sort were found by Moore (1899) in aboriginal mounds on the South Carolina coast. Several of the skulls collected by him are in the Peabody Museum, where I have had the privilege of studying them. Putnam (1896) considered them the same as those of the larger Madisonville dogs. More recently the M. C. Z. has received from Prof. Carlos de la Torre, two fragmentary skulls of dogs associated with pre-Columbian burials in Cuba. These skulls seem to be essentially similar as far as can be judged. Miller (1916) has reported a lower jaw of a dog from an Indian site in Cuba.

Three crania in excellent condition, from the Madisonville, Ohio, site agree in their somewhat slender proportions, with narrow palate and rostrum. A strong but thin bony crest is developed along the midline of the brain-case, and there is a noticeable inflation of the region just back of the supraorbital processes. The first premolar is absent in both cranium and jaw of one specimen. Two crania from a shell-heap at La Moine, Maine, similarly lack the first premolar. One of these latter is a much larger skull than any of those from Madisonville, which may indicate some variation in the local breeds.

yet the general type seems to be the same. Hardly distinguishable from the Maine specimens in any way is a skull from Peel River, Yukon, (U. S. N. M. 6,219) collected about 1860 by Kennicott and representing probably the common Indian Dog of that region.

Cranial Measurements	Ohio: Madisonville P. M. 58,528	Ohio: Madisonville P. M. 71,801	Ohio: Madisonville P. M.	Yukon: Peel R. U. S. N. M. 6,219	Ala.: Montgomery P. M. 68,868	Ga.: Ossabaw Id. P. M. 52,362	Cuba M. C. Z. 10,064	Maine A. C. 53,902	Maine A. C
Alveolus of i^1 to occipital condyle..	170	172	163	177	163	169	—	192±	168
Median length of nasals.........	56	62	57	—	57	57	—	—	—
Alveolus of i^1 to median edge of palate....................	85	90	87	88	86	90	—	93	—
Alveolus of i^1 to anterior edge of orbit....................	74	77.5	74	81	74	77	—	—	70±
Alveolus of i^1 to m^2..............	86	90	87	96	86	90	—	—	83
" " canine to m^2..........	72.5	75	72	79	71	74	74	86	70
" " p^1 to m^2...........	60	62.5	—	—	59	60	64	—	—
" " p^2 to m^2............	52	56	55	62.5	52	52	55	—	56
Alveoli m^1 and m^2..............	18.2	—	20.8	19	17	17	16.3	—	19.8
Length of p^4..................	19	18	18.6	20.5	17.5	18.5	—	20.8	19.7
Width of occipital condyles......	31	37.5	34	40	36	34	38	40	37
" " palate at m^1...........	59	57	61	66.5	54	60	62	68	55
" across supraorbital processes..................	50	51	47	49	46	57	—	60	—
Zygomatic width...............	102	98	104	101	92	104	—	—	—

Of seven lower jaws from Maine shell-heaps, all but one lack the first premolar, and the same tooth is lacking in a ramus from Madisonville. It seems to be missing in the greater portion of lower jaws of this dog. The following measurements show the lengths of different parts of the tooth-row taken at the alveolar borders, because the teeth themselves are frequently lost.

Tooth-row Measurements	Maine: Sawyer's Id.	Maine: Sawyer's Id.	Maine: Sawyer's Id.	Maine: Calf Id.	Maine: Calf Id.	Yukon: Peel River	Ohio: Madisonville
Alveoli, i_1 to m_3	99	—	100	—	97	105	87
" c to m_3	94	—	94	—	92	99	—
" p_2 to m_3	72.5	74	74	75	71.5	77	65
" p_3 to m_3	61	63	62	64	62	65	—
" p_4 to m_3	49	49	50	49	50	50	—
" m_1 to m_3	37	36	38	37	39	38	33.5
Length of tooth, m_1	22.5	22.3	23	21.5	24	23	21

Skeletal Measurements.— The first of the Calf Island jaws above, is accompanied by parts of the skeleton of the same animal. The limb-bones of this skeleton and those of several dogs from Madisonville, Ohio, measure:

	Maine: Calf Id.	Ohio: Madisonville	Ohio: Madisonville	Ohio	Ohio	Ohio	Ohio	Ohio	Ohio
Humerus	168	163	162	—	—	—	—	—	—
Radius	164	—	—	164	163	—	—	—	—
Femur	170±	—	—	—	—	173	—	—	—
Tibia	172	—	—	—	—	—	177	160	156

Notes and Descriptions.— On account of the finding of cranial fragments that appear to represent this animal, in aboriginal burials in Cuba, it is assumed that this is the dog mentioned by the first discoverers under Columbus. Oviedo (1535) writing of the aboriginal dogs in Haiti shortly after the discovery, declared that they were no longer to be found there in 1535, as all had been killed for food during a time of famine. These dogs he described as of all the colors found among the dogs of Spain, some uniformly colored, others marked with blackish and white, or reddish brown. The coat of some was woolly, of others silky or satiny, but most of those in Haiti were between silky and satiny, yet rougher than the Spanish dogs; with ears pointed and erect like those of wolves. None of these dogs barked. Oviedo adds that similar dogs were plentiful in many parts of the continent, as in Mexico, Santa Marta, and Nicaragua. He had eaten their flesh and considered it excellent, resembling lamb. In Nicaragua and Mexico the Indians bred numbers of them and at their great festivals dog-meat was considered the best dish of all. The natives of Haiti hunted some species of Hutia with these dogs.

Very little seems to have been written descriptive of this breed. In his essay on the origin of dogs, Hunter (1787) mentions that a Mr. Cameron, who had lived among the Cherokee Indians, informed him that the dog found in their country was "very similar to the wolf." Cameron thought it remarkable there were not sundry breeds of dogs among these Indians, as in Europe. William Bartram (1792, p. 220), during his travels in Florida, made special note of a "single black dog, which seemed to differ in no respect from the wolf of Florida, except his being able to bark as the common dog." It belonged to an Indian, who had trained it to tend a troop of semiwild horses, "keeping them in a separate company where they range; and when he is hungry or wants to see his master, in the evening he returns to town, but never stays at home at night." Barton (1805) appears to have made more particular inquiry of Bartram concerning these Indian Dogs of Florida, and describes them as "very similar to the *Canis Lycaon,* or black wolf," yet they are not always black "but of different colours, commonly of a bay colour, and about one third less than the wild black wolf. It carries its ears almost erect, and has the same wild and sly look that the wolf has." Barton adds that the dogs of the Cherokees were already (1805) much intermixed with the European dogs.

Peter Kalm informed John Bartram that the dogs of the Canadian Indians (?Montreal) were like those in Sweden with erect ears, and Bartram himself (in a letter to George Edwards, 1757) recalled as a boy seeing the Indian Dogs, with erect ears, accompanying their masters on occasional visits to his father's house in Pennsylvania. Barton (1805), who seems to have made diligent inquiry about these dogs, further describes their aspect as "much more that of the wolf than of the common domesticated dogs. His body, in general, is more slender than that of our dogs. He is remarkably small behind. His ears do not hang like those of our dogs, but stand erect, and are large and sharp-pointed. He has a long, small snout, and very sharp nose." This breed, he says, was still preserved in the greatest purity among the Six Nations, from whom the Delawares acknowledge that they received it.

Judging from the numerous shell-heap remains of what seems to be this same dog, it was formerly common among the New England Indians. In Haklúyt's Voyages (Everyman's Library ed., **6**, p. 95) is an account of The voyage of the ship called the Marigold of Mr. Hill of Redrife unto Cape Briton and beyond to the latitude of 44 degrees and an half, 1593. The narrator tells of meeting with a party of "Savages" at Cape Breton in July, who upon the accidental discharge of a musket, came "running right up over the bushes with great agilitie and swiftnesse. . .with white staves in their handes like halfe pikes, and their dogges of colour blacke not so bigge as a greyhounde followed them at their heeles; but wee retired unto our boate."

It is probably to this breed of dog that Charlevoix refers in his Journal of a voyage to North America (London, 2 vols, 1761, transl.). "The Indians," he writes, "always carry a great number of dogs with them in their huntings; these are the only domestick animals they breed, and that too only for hunting; they appear to be all of one species, with upright ears, and a long snout like that of a wolf" (**1**, p. 187).

This is the "major" type of Indian dog reported by Loomis and Young (1912) from Maine shell-heaps, where rather large-sized specimens have been discovered. Dog-remains have been found also in Connecticut (MacCurdy, 1914) and Block Island, R. I. (Eaton, 1898).

An Indian Dog-skull (Plate **7**) collected by Kennicott on the Peel River, about 1860 (U. S. N. M. 6,219) is hardly different, except for its very slightly greater size, and seems best referred to the same sort of dog, though possibly a distinguishable breed. Richardson (1829) named this dog *Canis familiaris* var. *canadensis*, and says it is the kind "most generally cultivated by the native tribes of Canada and the Fur countries." He describes it as intermediate in size and form between the Eskimo and the Hare-Indian Dog. Its fur is black and gray, mixed with white; some are all black. Apparently identical with the skull from Peel River is another collected by Dr. W. H. Dall, from a prehistoric Aleut village site in Unalaska. Dr. Dall notes that this is the only dog-skull which had been found in the undeniably prehistoric kitchen-middens of the Aleutian Islands. It still retains the upper carnassial, which measures 20.5 mm. in length. The occipital condyles are 38 mm. across. The first upper premolar was apparently lacking.

Probably it was a dog of this breed that Audubon figured as the Hare-Indian Dog, from a living one in the gardens of the Zoölogical

Society of London. Bernard R. Ross (1861) seems to have confused the two as well; for a skull collected by him at Fort Simpson and sent to the U. S. N. M. as "*Canis lagopus*" is even larger than the one from Peel River and almost undoubtedly a cross with an Eskimo Dog. Both skulls lack the first lower premolar.

In the North the Common Indian Dog is largely used among the forest Indians as a beast of burden.

Samuel Hearne, on his famous journey to Peel River, 1769–72, observed that the Indians' "kettles, and some other lumber, are always carried by dogs, which are trained to that service, and are very docile and tractable. * * * These dogs are equally willing to haul in a sledge, but as few of the men will be at the trouble of making sledges for them, the poor women are obliged to content themselves with lessening the bulk of their load, more than the weight, by making the dogs carry these articles only, which are always lashed on their backs, much after the same manner as packs are, or used formerly to be, on pack-horses."

KLAMATH-INDIAN DOG.

Characters.— A medium-sized dog, with a short, bushy tail.

Distribution.— So far as known, this peculiar breed was found only among the Indians in the Klamath River region of Oregon.

Remarks.— The only mention of this dog that I have found is the following by Gibbs (Suckley and Gibbs, 1860, p. 112):

"On the Klamath is a dog of good size, with a *short tail.* This is not more than six or seven inches long, and is bushy, or rather *broad,* it being as wide as a man's hand. I was assured they were not cut, and I never noticed longer tails on the pups. They have the usual erect ears and sharp muzzle of Indian dogs, but are (what is unusual with Indian dogs) often *brindled gray.*"

Presumably the shortened tail arose as an independent variation among dogs of the Plains-Indian Dog type and was preserved among these dogs through selective breeding. Similar short-tailed breeds are well known among European dogs, as in the English Sheep-dog, and certain varieties of Bull-terriers. MacFarlane (1905, p. 696) gives an account of a very much prized Eskimo Dog he owned in the Mackenzie District, that was born tailless and undersized, but proved an excellent sled-dog.

SHORT-LEGGED INDIAN DOG.

Plate **5**, fig. 1.

1829. *Canis familiaris* var. d. *novae caledoniae* Richardson, Fauna Boreali-Amer., **1**, p. 82.

(?) 1912. *Canis familiaris, minor* Indian dog, Loomis and Young, Amer. journ. sci., ser. 4, **34**, p. 26, fig. 4, D.

Characters.— Ears erect, head large in proportion, and body long; the legs relatively short but not distorted as in our Turnspits. Fur of the body short and sleek, that of the tail longer. This is possibly a derivative of the Common or Larger Indian Dog.

Distribution.— It is hardly possible to trace the former distribution of this type of dog. It was found by Richardson in southern British Columbia, and a dog apparently similar is known from Quebec, and perhaps formerly in New England and New York. Probably it was found among canoe-using or forest-living tribes in the North, hence was infrequent or absent in plains country.

Notes and Descriptions.— Apparently Richardson (1829) was the first to take special note of this breed. He found it among the Attnah or Carrier Indians of "New Caledonia," (now British Columbia) and it seems to have been bred as well by neighboring tribes as far south at least as northern California. For Gibbs (Suckley and Gibbs, 1860, p. 112) makes particular mention of seeing "one peculiar looking dog on Eel River, in the interior of northern California, among very wild Indians. It had *short* legs and long body, *like a turnspit.*" Suckley in the same work, briefly says that "the Indian dogs about the Dalles of the Columbia [Oregon] are so varied in appearance that no *special* description can be given. We might, however, make two types. The *large* * * * and the *small*, resembling the '*turnspit kind*' of which Mr. Gibbs speaks. The latter are generally white, or spotted liver and white, or black and white. This kind is kept more as a playmate for the children and a pet for the women."

It is significant that Suckley mentions the "varied" appearance of the Oregon dogs, so that it was possible to refer them in general to but two types. This may have been a result in part of the interbreeding of the larger and the smaller types, and in part perhaps of a mixture as Suckley suggests with European breeds already introduced.

Although generally associated with the Indians of British Columbia and neighboring parts of the northwestern United States, it seems likely that this or a similar breed may have been much more widely distributed over northern North America, as far east and south as Quebec, New England, and New York, if not farther. An excellent photograph given me by Mr. W. B. Cabot (Plate 5, fig. 1) was obtained a few years since among the Bersimis Indians, Quebec, and seems to represent a dog of the same general type. The large head, erect ears (somewhat laid back in the photograph), long, heavy body, short, straight legs, up-turned tail, agree well with other descriptions. This particular individual has the spiritless air of an old dog.

That this breed of dog was found at least as far south as the southern coast of New England, may possibly be inferred from the account by Livermore (1877, p. 58) of the dogs of the Block Island Indians, of Rhode Island. This isolated colony of Indians numbered some 300 individuals up to the year 1700, but by 1774 was reduced to only 51. In 1876, there was known to be but a single one living on the island. According to the author just mentioned, "the 'dogs' of Block Island belonging to the Manisseans before the English came have their descendants here still, it is believed. They are not numerous, but peculiar, differing materially from all the species which we have noticed on the mainland, both in figure and disposition. They are below a medium-size, with short legs but powerful, broad breasts, heavy quarters, massive head unlike the bulldog, the terrier, the hound, the mastiff, but resembling mostly the last; with a fierce disposition that in some makes but little distinction between friend and foe." The description here given, unsatisfactory though it be, implies a dog much like that shown in fig. 1, Plate 5.

Skeletal Remains.— I am unaware of the existence in any museum, of bones that may be definitely associated with the Short-legged Indian Dog. But, as pointed out by Loomis and Young (1912), there are in the prehistoric shell-heaps of the New England coast remains of a larger and a smaller Indian Dog, the latter of which on the strength of the evidence just given as to the former presence of the short-legged breed in eastern Canada and New England, may tentatively be referred to this animal. The authors mentioned have characterized the lower teeth of this smaller dog on the basis of jaws from the Maine shell-heaps and through the kindness of Professor Loomis I have had opportunity to study the specimens.

The mandibles are all more or less broken, but include several in fairly good condition. They differ from those of the Larger or Common Indian Dog in the smaller size of the individual teeth as well as in the shorter tooth-row. Yet the contrast is not always very striking and no doubt there was more or less intercrossing of the two types. The teeth of the smaller dog are usually more close-set than those of the larger, and on comparison, the carnassial tooth is seen to be decidedly smaller, its metaconid sometimes quite obsolete, and with a distinct tendency for the outer of the two cusps of the heel (hypoconid) to become enlarged and trenchant. As in the Common Indian Dog, and in American aboriginal dogs generally, it is common if not usual, for the first lower premolar to be lacking, and the same is frequently true of the first upper premolar. Such an anomaly is occasional in all domestic dogs. Indeed, Bourguignat (1875) founded his genus Lycorus on such a fossil canid jaw — probably of a wolf — from a cavern-deposit in France. In his specimen the first premolar was lacking in each ramus.

Measurements of the lower jaws and fragments of upper maxillae	Me. Flagg Is.	S 1	985	1209	C 1	C 2	183
Greatest length of lower carnassial	—	19.8	20.3	21	20	20.6	21.3
Number of lower premolars	—	3	3	3	3	3	4
Alveolar length p_2 to m_2	—	65.5	—	68 ‡	65	64	66
" " p_2 to p_4	—	33	31.5	34	32.5	32	33
Alveoli, upper p^3–m^2	39.5	—	—	—	—	—	—
" " p^4–m^2	29	—	—	—	—	—	—
" " m^{1-2}	16	—	—	—	—	—	—
Greatest length of p^4 (tooth)	17.3	—	—	—	—	—	—

Loomis and Young (1912) mention similar small jaws from Indian sites in Arkansas.

Of limb-bones referable to the Short-legged Dog it is particularly desirable to obtain specimens for comparison with the other breeds. Among limb-bones in the Amherst collection from Maine are several longer and shorter. The latter in the lack of evidence to the contrary, may be regarded as having come from the present type. Of two humeri, one is nearly perfect and appears to be that of an adult animal, with its epiphyses throughly fused to the shaft. Its olecranial perforation is large and oval, somewhat less than half the breadth of the shaft at the same point. The deltoid ridge is typically prominent. The bone itself is slender and not in any way thickened or distorted. It measures: — greatest length, 130 mm.; antero-posterior diameter of head, 31; transverse diameter of head, 25; transverse diameter of distal end, 25.5; width of distal articular surface, 17. It is thus about three quarters the length of the humerus in the Larger or Common Indian Dog, proportionally slender, yet considerably longer than that of the Techichi. What is undoubtedly the radius of the same dog, measures 129 mm. in greatest length; 14.5 in diameter at the proximal and 19 at the distal end. A femur, possibly of the same specimen measures: — greatest length, 136 mm.; greatest transverse width of distal end, 25. It is thus slightly longer than the humerus, in the normal proportion. The limb-bones indicate a dog about the stature of a terrier or a basset-hound.

Among many isolated lower jaws from Maine shell-heaps are some in which the carnassial tooth is noticeably narrow and intermediate in size between that of the typical Short-legged Dog and the Larger or Common Indian Dog. These probably represent cross-bred animals as Loomis and Young have suggested.

Uses.— These smaller dogs were apparently the familiar household pets or hunting companions of the Indians of forested country or of the canoe-using tribes. They were too small to be of service as pack-animals with *travois* or *pannier*, and hence seem not to have been much in favor with the Plains Indians, whose main subsistence was the Bison for the hunting of which, dogs were unnecessary. Suckley (1860) particularly mentions that they were kept more as a "play-mate for the children and a pet for the women" among the tribes of the Columbia River. Moreover, a small dog is a better companion in a canoe than a larger clumsy animal.

Richardson says of the Short-legged Dog, that it was used in the chase, was very active and agile at jumping. It was perhaps a dog of this type that was used in hunting the beaver. George Bird Grinnell (Forest and stream, 1897, **49**, p. 382) writes that the Cheyenne Indians, before their intercourse with whites, hunted the Beaver with dogs, by breaking the dam and thus exposing the beaver houses and their underwater entrance. "The dogs which were small enough to enter this hole, and yet were pretty good sized animals, went into the hole" and worried the beaver till it followed the dog out, when an Indian waiting outside, clubbed the beaver to death. Le Jeune, in his Relation de ce qui c'est passé en la Nouvelle France [Quebec] en l'anné 1633 (Jesuit relations, 1897, **5**, p. 165) mentions this use of dogs in Beaver hunting: "sometimes when the dogs encounter the Beaver outside its house, they pursue and take it easily; I have never seen this chase, but have been told of it; and the savages highly value a dog which scents and runs down this animal." Le Jeune speaks of the familiarity of the Indian dogs, that in winter they are unable to sleep outside and come into the cabins, lying and walking over the inmates. Elsewhere he speaks of giving food to a 'petit chien,' but adds that "the savages do not throw to the dogs the bones of female Beavers and Porcupines,— at least certain specified bones. . . . yet they make a thousand exceptions to this rule, for it does not matter if the vertebrae or rump of these animals be given to the dogs, but the rest must be thrown into the fire."

Testimony of early travellers is somewhat conflicting as to the eating of their dogs by the Indians. Le Jeune states that "in the famine which we endured, our savages would not eat their dogs, because they said that, if the dog was killed to be eaten, a man would be killed by blows from an axe." On other occasions, however, such scruples were not observed. Thus Father Rasles, in a letter written to his brother in 1716, from Narantsook, forty miles up the Kennebec River, Maine, says that at the news of the French and English War, the Indian young men were ordered by the older Indians to kill dogs for the purpose of making the war-feast (Jesuit relations, 1897, **67**, p. 203) — possibly here with a view to sending their dogs on before, should death overtake their masters. Feasts of dog-flesh seem to have been commoner among the Indians of the West and South, and Fremont in his narrative of his explorations (1845, p. 42) recounts being invited, as a mark of honor, to a dog-feast. "The dog was in a large pot over the fire, in the middle of the lodge, and immediately on our arrival was dished up in large wooden bowls, one of which was handed to each. The flesh appeared very glutinous, with something of the flavor and appearance of mutton. Feeling something move behind me, I looked round, and found that I had taken my seat among a litter of fat young puppies."

Harmon, writing in 1820, after nineteen years spent in travel through the Northwest from Montreal to the Pacific, speaks of the smaller dog used in hunting, and a larger dog as well. The latter is rank and not good eating like the former, of whose flesh the Indians and French Canadian *voyageurs* were very fond.

In the New England shell-heaps, the dog-remains occur either as burials — the entire skeleton undisturbed — or as scattered portions, as if the bones had been thrown out after the flesh was eaten. There seems, however, to be little or no evidence that the bones were cracked for marrow.

The Jesuit father Biard in 1616, mentions dogs, kettles, and axes as among the presents given by a young Indian to the father of his intended bride in payment for her. Among other customs of the Indians of Arcadia, he recounts that at a funeral, dogs are presented the dying man, as well as skins, arrows, and so forth. The dogs are then killed in order to send them on before him to the other world, and their flesh is later eaten by the people (Jesuit relations, 1896, **3**, p. 101).

Clallam-Indian Dog.

Plate **4**, fig. 1.

1840. *Canis laniger* Hamilton Smith, Jardine's Nat. library. Mammalia, **10**, p. 134.

1867. *Canis domesticus, camtschatkensis longipilis* Fitzinger, Sitzb. K. akad. wiss. Wien, **56**, pt. 1, p. 406.

Characters.— A medium-sized dog, with erect ears, and bushy tail. Hair rather thick and woolly; white, or perhaps brown and black.

Distribution.— Formerly found among the coast Indians of the Puget Sound region and Vancouver Island. Lord (1866, **2**, chap. 11) asserts that these dogs seem to have first been kept by the Chinook Indians, once very numerous near the mouth of the Columbia River, and were thence carried to Puget Sound and Nainimo. The source of this information is not given, but it is worth remarking that Lewis and Clark make no mention of the breed on the Columbia. Vancouver found them near the then Port Orchard, and apparently at least as far up the Sound as Admiralty Inlet. Hamilton Smith implies that they were to be found at Nootka Sound on the west coast of Vancouver Island.

Descriptions.— The earliest account of this dog is that by the navigator, Vancouver (1798, **1**, p. 266). In May, 1792, while at Port Orchard, Puget Sound, he writes:—

"The dogs belonging to this tribe of Indians [at Port Orchard] were numerous, and much resembled those of Pomerania, though in general somewhat larger. They were all shorn as close to the skin as sheep are in England; and so compact were their fleeces, that large portions could be lifted up by a corner without causing any separation. They were composed of a mixture of a coarse kind of wool, with very fine long hair, capable of being spun into yarn. This gave me reason to believe, that their woollen clothing might in part be composed of this material mixed with a finer kind of wool from some other animal, as their garments were all too fine to be manufactured from the coarse coating of the dog alone. The abundance of these garments amongst the few people we met with, indicates the animal from whence the raw material is procured, to be very common in this neighborhood; but as they have no one domesticated excepting the dog, their supply of wool for their clothing can only be obtained by hunting the wild creature that produces it; of which we could not obtain the least information." Elsewhere he mentions a deer "they had killed on the island, and from the number of persons that came from thence, the major part of the remaining inhabitants of the village, with a great number of their dogs, seemed to have been engaged in the chase," this near Admiralty Inlet. Farther up Puget Island, 48° 2½'N, 237° 57½'W, at a large village "they were met by upwards of two hundred [Indians], some in their canoes with their families, and others walking along the shore, attended by about forty dogs in a drove, shorn close to the skin like sheep [this in June]" (*Ibid.*, p. 284).

Hamilton Smith (1840) who, in addition to Vancouver's account, had information from an Indian who had resided two years at Nootka, speaks of it as a large dog, "with pointed upright ears, docile, but chiefly valuable on account of the immense load of fur it bears on the back, of white, and brown, and black colours, but having the woolly proportion so great and fine, that it may well be called a fleece."

Notwithstanding Smith's assertion as to the "brown and black colours" of this dog, it is not at all certain that this was the usual case. Suckley (1860, p. 112) says positively that "all the Clallam dogs that I saw were *pure white;* but they have the sharp nose, pointed ear, and hang-dog, thievish appearance of other Indian dogs." Gibbs also (*Ibid.*) mentions their whiteness only, and adds that the very soft hair is sheared like the wool of sheep, and made into blankets, though at that time, 1860, it was "generally intermixed with the ravellings of old English blankets to facilitate twisting with [?into] yarn."

Lord (1866) further remarks that this white, long-haired dog was kept by only a few coast tribes near Vancouver. The dogs were confined "on islands to prevent their extending or escaping," and it differed "in every specific detail from all the other breeds of dogs belonging to either coast or inland Indians." He supposes it to be of Japanese origin, recalling the long-haired Japanese Lap-dog, which however, seems remote enough in other characters. Lord adds that in the manufacture of rugs from the hair of this dog, the Indians often added the wool of the Mountain Goat, or duck feathers, or wild hemp. They dyed the hair as well. He obtained several of these blankets along the coast for the British Museum. Newcombe (1909, p. 50) gives a further account of the method of making yarn from the hair, which he says, was removed from the dried skin of the dog with knives or pulled out after moistening the hide and "sweating" the hair to loosen the roots. The wool was then made into loose threads by rolling. With the introduction of Hudson's Bay Company blankets this industry has ceased and the dog was practically extinct at the time of his writing.

As to the origin or affinities of this breed, little can be said. Some writers have classed it with the Siberian and Eskimo dogs, but it is likely that it was a breed of the larger type of Indian dog. The disinclination to take to water, made use of by the Indians to confine the animals to islands, is a trait shared by the Eskimo Dog. The precaution was possibly taken in order to prevent crossing with other breeds of Indian Dogs.

Windle and Humphreys (1890) in their table of cranial proportions of Eskimo Dogs, include those of a Nootka Dog in the British Museum. It is not clear, however, if it was from a dog of the breed under consideration, and as no actual dimensions are given, the figures are not comparable with other direct measurements.

I am indebted to Mr. C. T. Currelly, Curator of the Royal Ontario Museum of Archaeology at Toronto, for a photograph (Plate **4**, fig. 1) of the unique painting made at Victoria, B. C., in 1846, by Paul Kane and now at that Museum. In the foreground is one of the white woolly dogs in question, its apparently erect ears nearly hidden in the long hair of the head. Nearby an Indian woman is weaving a blanket, no doubt from yarn made of dogs' hair, a ball of which another woman in the background is spinning. The use of dogs' hair in making blankets is not confined to the Clallams. The ancient Zuñis appear to have made similar use of it; and Bannister (1869) mentions an Indian blanket from Mackenzie River, woven of dogs' hair. The natives of New Zealand regularly employed dogs' hair for braiding and ornament.

INCA DOG.

Plate 9.

1844. *Canis ingae* Tschudi, Unters. über die fauna Peruana. Therologie, p. 13, 249.

1885. *Canis ingae pecuarius* Nehring, Sitzb. Gesellsch. naturf. freunde Berlin, p. 5–13.

Characters.— This is the larger dog of the ancient Peruvians. It was about the size of a small Collie, but more heavily proportioned. Tschudi describes it as having the head small, snout rather sharply pointed, upper lip not cleft; ears erect, triangular, small; body short and strong, squarely built ("untersetzt"), legs rather short; tail about two thirds the length of body, fully haired and curled forward. Pelage rough, long, and thick; color dark ochre-yellow with dark wavy shadings; belly and inner side of limbs somewhat brighter than the ground color of the back. No light spots above the eyes.

The skull is heavy in proportion to its size, with a narrow rostrum. The brain-case is rugose for the attachment of muscles, yet the temporal muscles, even in old dogs seem to little more than meet medially, so that at most only a low sagittal crest is formed in old animals except at the extreme occiput, where it is contrastingly marked, forming a high knife-edge on the median line of the interparietal. The palate shows a strong thickening at its posterior end, forming two low ridges one on each side between the last molar and the posterior narial opening.

Distribution.— The former distribution of this breed has not been definitely traced. Mummified remains are known from Ancon, Peru, and from various sites that have been excavated in that country. In Tschudi's time it appeared to be confined to the upland tribes of Indians. Of this type were all the mummies and skulls of dogs found by him in the ancient graves among the Sierras. It probably was kept by the Indians of northwestern Argentina as well.

Nomenclature.— Tschudi in 1844, was apparently the first to name this as a distinct breed of dog, *Canis ingae.* Forty years later Nehring in writing of the dog-mummies from the ancient necropolis of Ancon, referred it to a collie-like type with the combination, *Canis ingae pecuarius.* It is, however, very different cranially and otherwise from the Collie.

Measurements.— The largest Inca Dog among those from Ancon studied by Nehring (1884a) was smaller than a Sheep-dog, with a skull about 172 mm. long, humerus 147, ulna 172, radius 140. A smaller one had a skull length of 165, head and body 660, tail including hair 240, humerus 130. In the lower jaws the first premolar was frequently missing.

The following table gives measurements of the six largest skulls among a series of nine belónging to the U. S. N. M.

Measurements of the Skulls	172,888	172,859	176,310	172,858	176,386	176,309
Length, (occiput to anterior base of incisors)	155	164	160	163	172	178
Basal length	139	145	146	144	151	159
Palatal length	78	81	81	79	84	86
Orbit to tip of premaxillary	63	69	66	68	72	75
Upper tooth-row	83	—	84	—	—	93
“ “ (alveoli)	80	84	82	82	85	89
Front of canine to back of molar^2 (crowns)	65	—	69	—	—	76
Front of canine to back of molar^2 (alveoli)	64	68	67	67	69	74
Length of premolar^4 (crown)	16.5	18	17	17.5	17.5	19
“ “ “ (alveolus)	16	17	16	16.5	17	17
“ “ molars$^{1-2}$ (crowns)	17	—	17	—	18	19
“ “ “ (alveoli)	15.5	17	15	16	16.5	17
Zygomatic width	92	99	98	96	108	107
Breadth of occipital condyles	32	34	33	32	34	35
Median length of nasals	48.5	—	51	52	55	56

Remarks.— Writing about 1844, Tschudi describes the chief characteristics of this dog as treachery and mischievousness. Every Indian hut and shepherd of the Sierra and puna had several. They seemed to show a special antipathy toward white people. A European traveller approaching an Indian hut on horseback would be beset by these dogs springing up against his horse to bite his legs. They are courageous, and fight an enemy with determination, dragging themselves to the attack even when mortally wounded. The Indians train them to track and capture tinamous.

In their great work on the Necropolis of Ancon, Reiss and Stübel include a brief chapter by Nehring (1884b) on the mummified remains of dogs discovered there. Some of these are figured and show a pale yellowish coloring with darker areas. In a more extensive article Nehring (1884a) gives a particular account of the dogs of Ancon. He first transcribes passages from Garcilasso de la Vega to show that the Incas had dogs previous to the Spanish conquest, and that the dog entered into certain religious rites of the Incas. A mummified dog is described as having thick hair, shorter, however, on head and feet, thickest on neck and breast forming a kind of mane. The color was yellow, clear or soiled in places, with irregular brown-shaded areas. The tail was thick and bushy, wolf-like, also yellow. The ears of most of the specimens seemed to have been clipped. He suggests the North American Wolf or Coyote as the original source of the Inca dogs, but there seems no ground for the selection of either as an immediate ancestor.

More recently, Eaton (1916, p. 25) has recorded the discovery of dog-mummies with pre-Columbian burials at Machu Picchu, Peru. He adds that "dogs of this general type, though usually a little smaller than those figured in Reiss and Stübel's Necropolis of Ancon, were frequently seen in the parts of the Cordillera that I visited, and these animals may be largely derived from the ancient stock. . . .The modern Indian dogs of this ancient type are very wolf-like and manifest a most inconvenient fear of the camera." He suggests the obvious possibility of present-day mixture with breeds imported from Europe, and gives a reproduction (p. 50, fig. 47) of a photograph showing dimly an Indian with his dog.

The fine series of Peruvian dog-skulls in the U. S. N. M. contains nine that show complete gradation in size between the smallest (which I have considered more or less typical of the Techichi) and the largest which represents the Inca Dog. Since these skulls are more or less comparable as to age, it seems likely that the gradation in size is due to free interbreeding of the two sorts of dogs. The largest skull of the series (U. S. N. M. 176,309, of which the measurements have been given) is almost precisely matched by the skull of a Common Indian Dog from Peel River, Arctic America, collected by Robert Kennicott about 1860 (U. S. N. M. 6,219). The only obvious differences are that the palate of the Inca Dog shows the peculiar thickened ridges at the posterior end and is much narrower across the occipital condyles. The latter characteristic is shared by the other dog-skulls from Peru in contrast with the northern dogs, and is no doubt among the latter a result of their use as sledge-dogs, for the greater development of the neck and chest muscles in hauling might well enough demand a broader support from the skull. This general similarity of skull and skeletal proportions probably indicates a closer relationship with the larger Indian dogs of northern North America, than with the Wolf or Coyote as Nehring has suggested.

What may be feral dogs of this breed are said to be found in the Island of Juan Fernandez, off Perú. According to Ermel (1889, p. 53) they are the native Araucarian dogs, shaggy-coated, of medium size, and very powerful. Semitamed ones are sometimes used there in hunting the feral goats.

Ihering (1913) has recorded the discovery of an entire skeleton of a dog at Hualfin, Salta Province, in northwestern Argentina. Its skull measurements, as recorded by this author, correspond well with the larger of those above given, and his identification of the specimen as an Inca Dog is probably correct.

Long-haired Inca Dog.

Characters.— Apparently similar to the Inca Dog, but with longer coat.

Distribution.— Peru and probably coastwise to parts of Chile.

Notes.— In his Bibliography of the tribes of Tierra del Fuego and adjacent territories, Cooper (1917, p. 44) mentions "a breed of long-haired shaggy dogs" which was formerly raised among some of the Chonos Indians north of the Taitao Peninsula, Chile, about Lat. 45° South. Nothing is known about these dogs except the statements of Goicueta and Del Techo, based perhaps on independent testimony. It is assumed that this breed was of native origin since at that early date (about 1553) it is rather unlikely that such dogs would have been obtained from Europeans. Possibly they were derived from the larger collie-like type of Inca dog anciently found among the Peruvians (Eaton, 1916, p. 49). From the hair of these dogs, the Chonos made short mantles that covered the shoulders and upper part of the trunk. According to Cooper, the information of Goicueta is based on the relation of Cortés Hojea's expedition of 1553–54, when he commanded one of the vessels under Ulloa, and possibly also furnished one of the sources for Del Techo's account. The latter was a Jesuit missionary who wrote in 1673 concerning the labors of his brethren among the Chonos of the Guaitecas Islands.

Referable to this breed is probably the long-haired dog described by Nehring (1887a) from a well-preserved mummy found in the course of excavations at Ancon, Peru. It was found wrapped in cloth of tree-wool, its head and feet tied together. In the size of its skull and leg-bones it was said to be like the ordinary Inca Dog of the collie-like type, but clothed with unusually long hair, especially on the feet and tail. The hair is described as of a dull yellow. This dog must have been very similar to the Long-haired Pueblo Dog previously mentioned as discovered by Messrs. Guernsey and Kidder in excavations at Marsh Pass, Arizona.

PATAGONIAN DOG.

Characters.— A medium-sized dog, as big as a large Foxhound, coat usually short and wiry, or longer and of softer texture; ears short and erect; color dark, more or less uniform, rarely spotted; dark brownish black, dark tan, or occasionally black; tail bushy. General appearance like a small Wolf.

Distribution.— Found among the Foot Indians of the eastern parts of Tierra del Fuego, northward into Patagonia, the northwestward limits of distribution not clearly known.

Remarks.— Hamilton Smith (1840, p. 213) quotes a letter from Captain Fitzroy of the BEAGLE, that the Patagonian Dog is strong, about the size of a large Foxhound, coat short and wiry, though sometimes soft and long, like that of a Newfoundland Dog. In color it is dark, nearly uniform, rarely spotted. It is wolfish in appearance, somewhat resembles the Shepherd Dog, will growl and bark loudly.

It is doubtless a dog of this breed that is meant by Furlong in his statement that of the two types of dogs found among the Onas of Tierra del Fuego, one is like a Wolf.

Cunningham (1871, p. 307) mentions that while near Gente Grande Bay, Sandy Point, in the Strait of Magellan, three dogs wandered about in the neighborhood of his landing party, "barking and howling dismally. The first was very much like a fox in size and general appearance, and of a reddish-gray colour; the second had a piebald smooth coat, with drooping ears; while the third was clothed with long dark brownish-black hair, had erect ears, and presented a marked resemblance to a small wolf." The first was probably a Fuegian Dog, obtained through intercourse with tribes of the western part of the Magellanic Archipelago; the second was possibly a mongrel European dog; the last perhaps a Patagonian Dog.

Of this animal, Spegazzini (1882, p. 176) writes that it differs greatly from the Fuegian Dogs of the Canoe Indians, "y para mí serian ó cruza ó descendientes directos del lobo-colorado ó gran zorro-colorado." It is difficult, however, to see any ground for deriving it from the peculiar Pampean Wolf. It is much larger than the Fuegian Dog, and is described by Spegazzini as tall, slenderly built, with fierce eyes; long-haired and bushy-tailed; the color prevailingly dark tan, but occasionally black; rather silent, not barking though giving voice to melancholy howls.

Fitzroy (see Hamilton Smith, 1840, p. 215) particularly describes a dog seen near the Strait of LeMaire. No temptation would induce its master to part with it. It was the size of a large setter, with a "wolfish appearance about the head, and looked extremely savage. Behind the shoulders it was quite smooth and short-haired, but from the shoulders forward it had thick rough hair," giving it a lion-like appearance, "of a dark grey colour, lighter beneath, and white on the belly and breast; the ears were short but pointed, the tail, smooth and tapering;" the fore quarters very strong but the hinder appearing weaker. The short-haired tail seems unnatural for a Patagonian Dog, and may have been evidence of a strain of blood from a European source.

The eastern Fuegians or Onas, are considered by ethnologists to be derivatives of the Patagonians, and no doubt originally had these dogs from their mainland relatives, or brought them at the time when they colonized the Fuegian country.

It is unfortunate that no bones or figures of the Patagonian Dog are available for comparison. Ihering (1913) has, however, recorded the skull of a prehistoric dog from Amaicha, Tucuman province, northwestern Argentina, which may represent it, and at the same time indicate nearly its northern range. This skull was 190 mm. in total (?occipitorostral) length, the upper fourth premolar 19 mm., the combined upper molars 20 mm., hence a somewhat larger breed than the Inca Dog.

The native Patagonian Dog is not to be confused with the dogs introduced by Europeans, that have since become feral on the pampas of southern South America. These, according to various writers (Rengger, 1830; Hamilton Smith, 1840; Rasse, 1879) are mongrel of several breeds, notably one like the Great Dane. They are said to go in troops and to make burrows in which to shelter their young. This burrowing habit has been noticed in case of other feral dogs. Thus Coues (1876) records the case of a brindled cur that became feral, and took up its habitation in a burrow on the open prairie, near Cheyenne, Wyoming, and in this den had a litter of five puppies.

Fitzinger (1867, p. 397) applies to the feral Pampean Dog the Latin combination "*Canis domesticus, pyrenaicus alco*" (!) and briefly states that it is probably a hybrid between the Pyrenian Dog and the Bulldog. Hamilton Smith (1840) had previously described it under the Latin name *Canis campiragus.*

As to the origin of the Patagonian Dog, there is little satisfactory evidence, but it may be assumed to be a derivative of the same stock as the Inca Dog. The tooth measurements of the skull recorded by von Ihering (1913), cf. p. 477, accord very nearly with those of the largest Inca Dog of our table (p. 473), though even larger.

MEXICAN HAIRLESS DOG; XOLOITZCUINTLI.

Plate **2**; Plate **3**, fig. 2.

1651. *Lupus mexicanus* Recchi and Lynceus, Rerum medicarum Novae Hispaniae thesaurus, p. 479, fig.
1766. *Canis mexicanus* Linné, Syst. nat., ed. 12, **1**, pt. 1, p. 60, (based on Recchi and Lynceus).
1788. *Canis familiaris aegyptius* Gmelin, Linné's Syst. nat., ed. 13, **1**, pt. 1, p. 68 (in part).
—— *Canis familiaris orthotus xoloitzcuintli* Reichenbach, Naturg. raubth., p. 150.
1821. *Canis nudus* Schinz, Cuv. thierreichs, **1**, p. 218.
1827. *Canis familiaris caraibaeus* Lesson, Man. mammalogie, p. 163.
1844. *Canis caraibicus* Tschudi, Fauna Peruana, Therologie, p. 249.
1887. *Dysodus gibbus* Cope, Amer. nat., **21**, p. 1126.

Characters.— A dog of medium-size, rather heavily built, and long-bodied in proportion to its height; ears large and erect; tail thick, drooping or carried nearly straight behind; hair nearly absent except for a few coarse vibrissae and generally a sparse coating on the tail, particularly near the tip; sometimes a tuft on the crown. The skin is usually pigmented, a slaty gray, or reddish gray, paler in the bends of the legs; sometimes blotched with white.

Distribution.— This race seems to have been native among the peoples of Central and South America from Chihuahua perhaps continuously southward, to the Peruvian lowlands, and in some of the Greater Antilles; it may also have been indigenous among the Indians of Paraguay.

History.— The first account of the Mexican Hairless Dog by a

European, seems to be that of Francisco Hernandez, who lived between the years 1514 and 1578. His Historia Animalium et Mineralium Novae Hispaniae, is printed on 96 folio pages as part of Recchi and Lynceus's Rerum Medicarum Novae Hispaniae Thesaurus, 1651, which was apparently intended as a monographic elaboration of Hernandez's work. This writer brought back an account of three sorts of dogs, which were in his day kept by the native Mexicans. The first of these he had himself seen, but the two others he had neither seen, nor known of their having been brought to Europe. This first sort he states, is called the *Xoloytzcuintli* and is larger than the others, exceeding three feet in body length, but with the peculiarity of having no hairy covering, yet with a soft skin, spotted with fulvous and slate color. ("Primus Xoloytzcuintli vocatus alios corporis vincit magnitudine, quae tres plerum; excedit cubitos, sed habet peculiare nullis pilis tegi, verum molli tantum, ac depili cuti, fuluo atque Cyaneo colore maculata."). The two other sorts of dogs were the hump-backed or Michuacan dog and the Techichi, elsewhere discussed. The *Xoloytzcuintli* of Hernandez is clearly the Hairless Dog, and a most elaborate account of the animal is given by Recchi and Lynceus (1651, p. 479 ff.) with a fairly recognizable figure (Plate 2, fig. 1). These authors apparently had an actual specimen, possibly one brought alive to Europe; at all events they describe its appearance as fierce and wolf-like, with a few bristly hairs about the mouth, the mammae ten as in the wolf and dog, and the vertebrae of the same number as in a dog-skeleton with which they compared it, namely seven cervicals, thirteen dorsals, seven lumbosacrals, seventeen caudals. They name the animal *Lupus mexicanus* in contradistinction to their Alco or *Canis mexicaña*, which was probably a Raccoon. This name appears in zoölogical nomenclature in the twelfth edition of Linné's Systema naturae under the genus Canis. The diagnosis, evidently based on the figure and description just noticed, reads: "C. cauda deflexa laevi, corpore cinereo fasciis fuscis maculisque fulvis variegata"; the habitat is given as the warmer parts of Mexico. Linné's first reference is to Brisson, whose description — "Canis cinereus, maculis fulvis variegatus" — is clearly from the same source. Hitherto Linné's *Canis mexicanus* has been regarded as applying to the wolf of Southern Mexico, but no true wolf is known from that part of the country. Miller (1912a) seems to have been the first to question the propriety of using the name for a wolf, but leaves the matter unsettled, saying that according to E. W. Nelson, "the wolf of the southern end of the Mexican tableland became extinct about fifty years ago" (1860). Some other name must therefore be applied to this wolf if it ever be shown to be distinct.

The above accounts by Hernandez and by Recchi and Lynceus are the basis of most of the earlier references to the Mexican Hairless Dog. Lesson, in 1827, however, redescribed it under the name *caraibaeus*, and Gmelin, earlier, 1788, had considered it the same as the Turkish or Egyptian Hairless Dog, under the name *Canis f. aegyptius;* this however, is a hairless variety of another breed.

Notes.— The former distribution of this remarkable dog is now hardly traceable with certainty except in a general way, but it was kept by the Mexicans of Chihuahua and southward, as well as by the natives of Peru, more especially those of the lower altitudes. According to Seler (1890) the Mexicans wrapped these dogs in cloths at night as a protection against cold. Some were not naturally hairless, but were rubbed with turpentine from early youth, causing the hair to fall out. On the other hand, dogs naturally hairless were raised, as at the pueblos Teotlixco and Tocilan. The Zapotec and Maya languages have separate words for the hairless dog. The term *xoloitzcuintli* is said to signify the monstrous dog. Patrick Browne (1789, p. 486) writing of the natural history of Jamaica, mentions the Indian dog as "Canis pilis carens, minor," a creature "frequent among the *Jews* and *negroes*" in that island; he describes it as "generally about the size of a cur-dog with a rough skin, which looks like the hide of a hog." There is nothing to indicate, however, that the breed was common in the West Indies.

In Peru, Tschudi (1844, p. 249) observed this dog mainly on the coast, since its lack of a hairy coat made it unable to withstand the cold of the higher altitudes of the interior except in the warm valleys, and then only if carefully protected. He describes it as slaty gray or reddish gray, sometimes spotted, and says it is voiceless. He is probably mistaken, however, in supposing these were the dogs found by Columbus among the Lucayans. Nearly twenty years previously, Lesson had seen the Hairless Dog in numbers at Payta, Peru.

According to Rengger (1830), a hairless dog, possibly identical with the Mexican Hairless Dog, was indigenous among the Indians of Paraguay, who had a special word — *yagua* — for it. He describes it as having a relatively small head, pointed snout, ears erect or only their tips drooping forward, rump fat, extremities fine, tail spindle-shaped and usually drooping. Some individuals do not bark, but howl only.

During the last hundred years, little attention seems to have been given to this breed, although lately it has been taken up by dog fanciers. LeConte, in 1856, calls it the Comanche Dog, and says it is common among the Indians of that tribe, but, "though some of these dogs have been brought within the United States, we have no description of them." Packard (1885) mentions seeing one in his visit to Mexico, but they were apparently uncommon. In a recent letter from Mr. Arthur Stockdale, he states that in Mexico City they are now considered somewhat of a rarity, though said to be common in Chihuahua, where however, little attention is paid them.

There is some evidence that they do not breed readily with normally haired dogs, yet such crosses have been made, and curiously the result seems to be that about 50% of the young are naked or practically so, the other 50% fully haired. Stockdale (1917) records such a litter consisting of two puppies, one hairless, the other normal. Kohn (1911) records a mating of a Hairless Dog with a Fox-terrier, the four offspring of which comprised two naked and two completely-haired dogs. His microscopic study of the skin of the Hairless Dog indicates that its character is that of a young embryo's, whence it may be that the hairless character is merely the retention of the embryonic condition, just as the short-nosed skull of the Japanese Lap-dog seems to be a case of the retention of the embryonic proportions of the skull.

As to the origin of this breed, it is most likely a variant of the larger type of Indian Dog, in which the hairlessness is due to a retention of the embryonic condition of the skin, precluding hair development, just as the short-nosed breeds of dogs are the result of the failure of the facial bones to attain full growth.

I have unfortunately been unable to obtain skulls for comparison.

SMALL INDIAN DOG OR TECHICHI.

Plate **10**.

1788. *Canis familiaris americanus* Gmelin, Linné's Syst. nat., ed. 13, **1**, pt. 1, p. 66 (in part).

1792. *Canis americanus plancus* Kerr, Animal kingdom, **1**, p. 136 (based on the Techichi of Hernandez).

1840. *?Canis alco* Hamilton Smith, Jardine's Nat. library. Mammalia, **10**, p. 135, pl. 4, left-hand fig.

1841. *?Canis familiaris cayennensis* Blainville, Ostéographie. Atlas, pl. 7[1].

1867. *Canis caraibaeus, hernandesii* Fitzinger, Sitzb. K. akad. wiss., Wien, **56**, pt. 1, p. 498.

1882. *?Canis gibbus* Dugés, La naturaleza, **5**, p. 14, fig. 1–3.

Characters.— A small, light-limbed dog, of rather slender proportions, narrow delicate head, fine muzzle, erect ears, well-developed tail, which may have been close-haired. Colors black, black and white, or perhaps brownish or yellowish.

Distribution.— This was perhaps the dog of fox-like appearance noticed by many of the early explorers, yet it is difficult to indicate the limits of its former distribution. On the Atlantic seaboard, among the considerable quantity of skeletal remains examined, I have seen nothing that could be referred to such a dog; yet Brereton, who reached the Elizabeth Islands and coast of southern New England with Gosnold in 1602, mentions "Dogs like Foxes, blacke and sharpe nosed" among the "Commodities" seen there. In the famous village site near Madisonville, southwestern Ohio, its bones occur and there are in the Peabody Museum similar bones from the southwest and Yucatan, believed equally to be pre-Columbian. Among the dog-skulls found with Peruvian burials the same type occurs, as well as skulls intermediate between this and other dogs, and so probably representing mongrel individuals. Probably then this type of dog was spread over at least the central and southwestern part of North America and parts of northwestern South America.

Nomenclature.— This is assumed to be the Techichi of the early Spanish accounts of Mexican dogs, though there is little doubt that two different animals as well as more than one breed of dog were confused under this title by the early writers and systematists. It is of some importance, therefore, to examine their accounts carefully since the case is somewhat complex and involves the identity of the Alco of early writers. Both Gmelin and Kerr based their names on the account of Recchi and Lynceus (1651, p. 466), who in turn refer to Hernandez's brief account (which they print), in the Historiae animalium et mineralium Novae Hispaniae, page 7. Hernandez who died in 1578, had visited Mexico, and in his enumeration of its animals includes three sorts of native dogs. The first of these is unquestionably the Mexican Hairless Dog, and as he himself states, was the only one he saw personally ("caeteros verò neque conspexeram, neque adhuc eo[*i. e.* ad Europam] delatos puto").

His account of the two other dogs is important and reads:— "Secundus Melitensibus canibus similis est, candido, nigro, ac fuluo colore varius, sed giberosus, gratusque iucunda quadam deformitate, ac capite velut ab humeris edito, quem Michuacanensem abora vnde est oriundus vocare solent. Tertius verò nuncupatus Techichi, Catulis similis est nostratibus, Indis edulis, tristi aspectu, ac caetera vulgaribus similis. Atque haec de canibus Nouae Hispaniae breuiter dicta sunto." Translated freely, "The second is like the Maltese dogs, in color varied with white, black, and fulvous, but it is hump-backed and prized for this pleasing deformity, and a head that appears to grow from the shoulders. It is called the Michuacan dog from the place where it is native. The third sort of dog, however, is called Techichi, and is like our Spaniels, but of sad countenance, though in other respects like ordinary dogs. It is eaten by the Indians. This then is briefly what I have to say of the dogs of Mexico." The Techichi apparently was in no wise peculiar as a small dog. The Michuacan animal, however, was hump-backed, without conspicuous neck, its colors white, black, and fulvous, "varius." In their elaboration of Hernandez's account, Recchi and Lynceus (1651, p. 466) fail to distinguish between these two supposed dogs; at all events their figure (Plate **3**, fig. 1) and description deal altogether with the hump-backed animal, of which they seem to have had some knowledge or probably a preserved specimen. They figure a female under the name '*Canis Mexicana*' and the Mexican name *Ytzcuinteporzotli*, the first half of which signifies 'dog.' Buffon, and later Gmelin, likewise failed to distinguish between Hernandez's second and third sorts of dogs, and the latter author in 1788, combined the two under the name *Americanus*, with a brief diagnosis based on the figure of Recchi and Lynceus, viz., "magnitudine ι [*i. e.* of the breed *melitaeus*], capite parvo, auribus pendulis, dorso curvato, cauda brevi." Under this name, Gmelin included: a. Ytzcuinteporzotli, or the *Canis mexicana* of Recchi and Lynceus and b. Techichi of Hernandez. Obviously the diagnosis applies to the hump-backed animal only, to which Buffon had already applied the native name Alco, following Recchi and Lynceus. This name appears to have been of doubtful application to the common dog, but was used at times by later writers to indicate the small native dog of Peru and Mexico. Kerr (1792, p. 136) endeavors to improve on Gmelin by distinguishing with Latin names the two varieties of the latter's *Canis americanus*. He first transcribes the description and then distinguishes: "a. Fat Alco. — *Canis americanus obesus*" and "b. Techichi.— *Canis americanus plancus*," with descriptive accounts from Hernandez and his eloborators, corresponding to Gmelin's "a" and "b."

What then was this Alco? A study of Recchi and Lynceus's figure (Plate **3**, fig. 1) and description seem to indicate clearly that they had in mind a Raccoon. They describe its nose, forehead, and eyebrows as white, these markings evidently delimiting the dark face, while the peculiar and characteristic upward slope of the back in the live animal is thus described: "Dorsum cameli instar gibbosum, post collum subito ad pectus accliue, sed coxas versus decliue." The tail is said to be short, barely reaching the heel, the mammae six in number. They further note its very fat belly, beautifully covered with thick black hair varied with spots; feet and shanks whitish, claws strongly exserted. These characteristics recall the Raccoon more than any other animal. There are, however, eight mammae in this animal, and the ears are not pendulous as described, but these discrepancies may be due to inaccuracy of observation, or the condition of the specimen (perhaps a preserved hide) which the authors seem to have had. The account quoted from Acosta (1590, p. 277) doubtless refers to the same animal and not to a dog. This author, in his Historia natural y moral de las Indias, writes: — "Verdaderos perros no los auia en Indios, sino unos semejantes a perrillos, que los Indios llamauan Alco: y por su semejana a los que há sido lleuados de España, tambien los llaman Alco: y son tan amigos destos perrillos que se quitaran el comer, por darselo: y quando van camino, los lleuan consigo acuestas, o en el seno." (Of real dogs there are none in the Indies, save certain animals resembling little dogs, which the Indians call Alco; and on account of their resemblance to our dogs brought here from Spain, the Indians call these Alco as well: and so fond are they of their little dogs that they deny themselves of food in order to give it to them; and when they go on a journey they carry the little dogs with them on their shoulders or in their arms). The Raccoon rather than a small dog seems to be indicated here, and the habit of carrying them about on journeys would perhaps account for the present-day anomalous distribution of the small species of raccoon in Central America (Panama) and in the islands of Cozumel, Guadeloupe and New Providence. Acosta's story may also explain the transference of the name Alco to small dogs, though Philippi (1886) says this means dog in the Quichua tongue.

An early mention of the tame Raccoon is found in Hakluyt's Voyages, in A relation of the commodities of Nova Hispania, and the maners of the inhabitants, written by Henry Hawkes merchant, which lived five yeeres in the sayd countrey, written in 1572. He says: "Their dogs are all crooked backt, as many as are of the countrey breed, and cannot run fast: their faces are like the face of a pig or a hog, with sharpe noses."

If Gmelin's name *americanus* be admitted as applying to a Raccoon it would antedate Wagler's name *hernandezii* (1831) for a Mexican

Raccoon. In view, however, of the uncertainty as to which form of Raccoon it should indicate, there seems to be no virtue in making such a change at present.

Later writers have tried to discover living examples of the original Alco with small success. Hamilton Smith (1840, p. 135, pl. 4, left-hand fig.) describes as *Canis alco,* what he supposed to represent this breed, from a stuffed specimen in an exhibition of Mexican curiosities made by W. Bullock, and said then to be in the Egyptian Hall (British Museum). He says of it: "That enterprising traveller described it as of the wild race; yet, from its appearance, we at first considered it to be a Newfoundland puppy." The figure shows a small black and white dog with rather full-haired tail, clumsy build, and ears laid back. Of the mounted specimen, Hamilton Smith further writes:—"It was small, with rather a large head; elongated occiput; full muzzle; pendulous ears; having long soft hair on the body. In colour, it was entirely white, excepting a large black spot covering each ear, and part of the forehead and cheek, with a fulvous mark above each eye, and another black spot on the rump; the tail was rather long, well fringed, and white." This description, except for the pendulous ears might apply well enough to the type of small dog here treated. How much of its appearance was due to the taxidermist's efforts is, however, to be considered. It is even possible that it was after all only a spaniel, which, except for its short ears, it seems to resemble.

What seems to have been a slightly deformed Indian Dog, is described and figured by Dugés (1882) as a Chihuahua Dog (a term that is used by fanciers for a dwarf breed, with erect ears). From his figure of the skull, it is evident that the animal was young. It was apparently rather small, had but three lower premolars (the first lacking), a rather heavy head, and long close-haired tail. The back seems to have been unduly arched but the head is represented as erect, and the posture quite different from that of a raccoon. The color was blotched black and white. The ears were cropped, but were assumed to have been erect. So far as can be judged from Dugés's account, this may have been a dog similar to the Techichi. He, however, supposed it to represent the Alco.

The confusion of names has been added to by Cope (1887) who examined three skulls of the so called Chihuahua Dog. He found a variable reduction in the number of teeth, correlated apparently with the loss of hair. The premolars were reduced to $\frac{2}{3}$ or $\frac{3}{3}$, while the molars were $\frac{0}{2}$, $\frac{1}{2}$, and $\frac{2}{2}$ respectively. In all, the inner cusp of the lower sectorial was lacking. On account of the reduced number of molars, and this character of the sectorial, Cope refers this breed to his genus Dysodus (Cope, 1879, 1879a) based on the Japanese Lapdog, adding that "the species may be called *Dysodus gibbus,*" for "the Chihuahua dog is the *Canis gibbus* of Hernandez." The animal to which Hernandez applied the adjective "*giberosus,*" however, was with little doubt a Raccoon.

Skeletal Remains.— Among a great number of bones of Indian dogs examined, from mounds, burials, or refuse deposits in various parts of America, there occur skulls or fragments of jaws appertaining to a wholly different type of dog from the large varieties just described. The remains indicate a small light-limbed animal, with slender muzzle abruptly narrowed in front of the third premolar. Although the surface of the brain-case in adults is roughened for muscular attachment the sagittal crest does not develop till old age. All the teeth are small (upper carnassial 14–16.5 mm. in length), the nasals long, and the skull normal, in that it seems not shortened or broadened in any way, the teeth not crowded. A transverse line at the end of the palate falls about through the middle of the second molar. These dogs are probably the third variety of Hernandez, the Techichi or Small Indian Dog. Several skulls, more or less imperfect, from the Madisonville, Ohio, village site are referred to this breed, though their measurements are a very little larger than those of more southern specimens. They occur here together with bones of the large type of Indian Dog. An imperfect cranium (M. C. Z. 7,123) collected many years ago in McPherson's Cave, Virginia, by Lucien Carr, is apparently in every respect similar to a skull of this type from Pecos, N. M., obtained by Dr. A. V. Kidder in the course of excavating a village site. A similar but slightly smaller, though adult, skull from Pueblo excavations in the southwest is practically the same, as is also a skull of the Papago Indian Dog obtained by the late Dr. Edgar A. Mearns at Sonoyta, Sonora, while on the Mexican Boundary Survey. It is not fully adult, though of nearly mature dimensions. What seems to be a dog of this type is represented in the Peabody Museum by a cranium and hind leg-bones from Labna, Yucatan; the rostrum is damaged and the teeth lost except the carnassial. The long slender limb-bones are in strong contrast with the short thick bones of the Short-nosed Indian Dog.

Turning now to South America, the Museum has a cranium from Surinam, labeled: — Carib Indian Dog. It was received through the Boston Society of Natural History from the Wyman Collection, and was probably collected by Dr. F. W. Cragin, some fifty years ago

Though it has acquired the adult dentition, it is not old, and the temporal ridges have not yet united to form a crest. A very similar skull from French Guiana is figured by Blainville (1841) under the name *Canis familiaris cayennensis*, by which he seems to have intended to name the native dog.

I am indebted to Dr. W. C. Farrabee for a photograph, (Plate 5, fig. 2) which is assumed to illustrate this dog. It was secured by him while studying the Macusi tribe in southern British Guiana, and shows an old dog, and a puppy, accompanying a child of the tribe. The larger dog has a narrow head, and erect ears, the tips of which have been cropped, probably as a propitiation to evil spirits; the body is short in proportion to the lean limbs, the tail (better seen in the picture of the puppy) is long, upcurving, and like the body, short-haired. Dr. Farrabee writes that these dogs "are small, yellow and white, or brindle and white, and may be very much mixed with European dogs." Of their ancestry, however, there is no evidence, though the erect ears and slender proportions favor the supposition that they retain a measure of their aboriginal character. The expression of the larger dog recalls the "tristi aspectu" of Hernandez's description of the Techichi. It is not unlikely that the small dogs found by the Jesuits among the Indians of the southern Antilles and parts of Colombia and Central America may have been of the breed here described.

Dr. Farrabee writes me further concerning some larger dogs which he saw among the Wanoai tribe "who occupy the Akarai Mountains, northern Brazil to southern British Guiana. This tribe, on the Brazil side had never seen white men before [his visit]. They have the best dogs of all the tribes visited and they take the best care of them. These dogs are noted among the tribes a month's journey away. They keep the dogs tied on raised platforms and allow them exercise morning and evening. The dogs are all black and white and of good size." A small photograph of these dogs shows a hound-like aspect and drooping ears. They are probably of European origin and perhaps the same as the dogs mentioned by Bancroft (1769, p. 140) who says: "The Dogs of *Guiana* seem to be of a species between the Hound and Land-Spaniel: their make is slender, their ears long and pendulous, with a blunt nose, and large mouth: their bodies are covered with long shaggy hair, generally of a fallow colour. They pursue and start the Game by the scent."

I am indebted to J. Rodway, Esq., of the Museum at Georgetown, British Guiana, for a brief note on the hunting-dog of the present-day

Indians of that country. He considers that it is of undoubted European origin, "has no particular characters," and "could be matched in any lot of mongrels. It is generally rather small with a pointed muzzle, foxy looking, and kept hungry to prevent laziness." The "foxy" appearance is somewhat typical of the native breeds of smaller Indian dogs, a result of the fine muzzle, ample erect ears, and drooping tail, traits which seem still traceable among these mongrels of the modern Guiana Indians.

Among a series of dog-skulls (belonging to the U. S. N. M.) from ancient burials in Peru are two which in their small size and slender proportions seem referable to the Techichi. Both are fully adult, with a well-developed sagittal crest on the interparietal, extending forward in the larger skull on to the parietal suture. As will be seen from the table of measurements appended these skulls are a very little larger, with slightly shorter nasals, as compared with the other skulls whose dimensions are given. It is possible that this is due to some admixture with the short-nosed breeds. Nevertheless the skulls in question are quite different from the latter in their slender and narrow outlines, and unshortened tooth-row.

No doubt, did we know the external characters of the dogs whose skulls are here listed, it would be possible to recognize more than one breed. Thus the Ohio individuals are a trifle larger in dimensions than those of the Southwest and the Peruvian dogs again are a little larger. Yet all are clearly of the same general type.

A comparison of the skulls and measurements of these specimens with those of the *Canis palustris* of Rütimeyer from the Swiss Lake-Dwellings of late Neolithic to Bronze times in Europe, reveals a rather close correspondence which is probably more than accidental, and may even indicate a derivation from some common Asiatic stock at a very early period. The type of small dog of the Swiss Lake-Dwellings was one apparently of general distribution in southern Europe during the Neolithic time, and Woldrich (1886a) has identified it as far north as Denmark in the kitchen-middens. It was apparently, on the average, of wider zygomatic breadth, but otherwise its dimensions corresponded very closely. This evidence favors the view that a dog of this type was one of the earliest to be domesticated and was of wide distribution in an early period of human culture. Remains of a larger type of dog, *C. intermedius*, are also wide-spread in late Neolithic or Bronze culture layers of middle Europe, and correspond broadly to the larger type of Indian dog, a parallelism that is suggestive of the common origin of the large and the small types of dogs in Europe and America, probably from Asiatic prototypes.

Cranial Measurements	Ohio: Madisonville P. M. 67,700	Pueblo Indians P. M.	Va.: Lee Co. M. C. Z. 7,123	N. M.: Pecos M. C. Z. 9,520	Sonora: Sonoyta U. S. N. M. 63,169	Surinam M. C. Z. 10,844	Peru: Chicama U. S. N. M. 172,861	Peru: Coyungo U. S. N. M. 176,387	Yucatan: Labna P. M.
Alveolus of i^1 to occipital condyle	—	132	140	138	142	137	139	145	—
“ “ “ “ median edge of palate	—	71	74	74.5	76	73	74	78	—
Alveolus of i^1 to orbit	67	61	63	64	64	62	61	62	—
“ “ “ “ alveolus of molar ²	80	74	77	77.5	77	76	76	80	—
“ “ c “ “ “ m^2	67	61	63	65	64.5	64	63	65	—
“ “ p^1 “ “ “ m^2	54	49	51	52	51	50	51.5	49	—
“ “ p^2 “ “ “ m^2	47	42.5	46	47	46	45	45	43	—
“ “ m^1 “ “ “ m^2	17	—	14	16	15	14	16	16	—
Length of upper carnassial, p^4	16.6	14.5	14.3	15.5	15	14	16.3	16	16
Median length of nasals	—	—	—	48	49	47	45	45	44
Width across occipital condyles	—	—	29	31	29	33	31	32	—
“ “ palate at m^1	52.5	53	51	51	47	47	55	56	—
“ “ supraorbital processes	43	41	—	39	—	40	42	46	—
“ “ zygomata	—	84	83	84	82	77	90	—	78
Lower jaw, alveoli i_1 to m_3	—	—	—	79	79	—	—	—	—
“ “ “ c to m_3	—	76	—	74	74.5	—	—	—	—
“ “ “ p_2 to m_3	—	59	—	58	57	—	—	—	—
“ “ “ p_3 to m_3	—	—	—	49	48.5	—	—	—	—
“ “ “ p_4 to m_3	—	—	—	40	39	—	—	—	—
“ “ “ m_1 to m_3	—	—	—	32	30	—	—	—	—
Length of m_1	—	18.5	—	18	17.5	—	—	—	—
Skeletal Measurements									
Femur	—	—	—	—	—	—	—	—	128
Tibia	—	—	—	—	—	—	—	—	130

Early Accounts.— Hernandez disposes of the Techichi in few words, as being the third sort of dog he knew to be found in Mexico. It must have become scarce by his time (about 1578) as he had not seen it himself but describes it thus: — “Catulis similis est nostratibus, Indis edulis, tristi aspectu, ac caetera vulgaribus similis” (similar to our spaniels, eaten by the Indians, of melancholy visage, but otherwise like the common dogs). J. Jonstonus, writing in 1657, includes in his account of dogs, a transcription of Hernandez’s passage as to the three sorts of dogs in Mexico. He adds further that the Indians of Cozumel Island ate these dogs as the Spaniards do rabbits. Those intended for this purpose were castrated in order to fatten them.

Clavigero, the historian of early Mexico, wrote that the breed was extinct in his time, due, as he supposes, to the Spaniards' having provided their markets with them in lieu of sheep and cattle.

Possibly this breed of dog is the one mentioned in De Soto's relation of his march through Florida. At one place the cacique of the village sent him a present including "many conies and partridges. . . .many dogs. . . .which were as much esteemed as though they had been fat sheep." At another place, "the Christians being seen to go after dogs, for their flesh, which the Indians do not eat, they gave them three hundred of these animals." Again, at a small Indian village called Etocali, the expedition got "maize, beans, and little dogs, which were no small relief to the people."

As late as 1805, Barton (1805, p. 12) who had made special inquiry of William Bartram, as to the dogs of the Florida Indians, quotes him, that the latter had in addition to the larger dogs, a smaller breed, about the size of a fox, which probably was of the type under discussion.

It is probably this dog, if not also the short-nosed variety, that figures largely in the mythology of the Mayas of Yucatan. Among several representations of the dog in the Mayan codices are seen short-nosed and long-nosed heads, but whether these really indicate different breeds of dogs or different artists that made them cannot be determined. All are shown with erect, sometimes with cropped ears, a tail that is of medium length, usually shaggy, and recurved. Black patches are commonly represented on the body, and the eye of the dog often centers in a black area. Seler (1890) speaks of its use as a sacrificial animal in Yucatan, sometimes in place of a human being. Placed in the grave, the dog carried its master's soul across the "Chicunauhapan" or nine-fold flowing stream. According to Sahagun, some were black and white, others dark red, and there were short-haired and long-haired dogs, but he does not state whether the small and the large types of dogs each had short-haired and long-haired varieties. A brief summary of the significance of the dog in the religious life of the Mayas is given by Tozzer and Allen (1910, p. 359).

HARE-INDIAN DOG.

Plate 1, fig. 2.

1829. *Canis lagopus* Richardson, Fauna Boreali-Amer., **1**, p. 78, pl. 5 (not *Canis lagopus* Linné, 1758, *q. e.* Alopex).

1867. *Canis domesticus, lagopus* Fitzinger, Sitzb K. akad. wiss. Wien, **56**, pt. 1, p. 407.

— *Canis familiaris orthotus lagopus* Reichenbach, Regn. anim., pt. 1, p. 13.

Characters.— A small, slender dog, with erect ears and bushy tail, feet broad and well-haired. Color white with dark patches.

Distribution.— Formerly found among the Hare Indians and other tribes that frequented the borders of Great Bear Lake and the banks of the Mackenzie River.

Description.— This seems to have been a small dog, of the Techichi type. Richardson, who gave a figure and description of it from first-hand acquaintance, characterizes it as slightly larger than a fox but smaller than a coyote, and apparently of rather slender proportions. The head was small with sharp muzzle, erect thickish ears, somewhat oblique eyes; the tail bushy and sometimes carried curled forward over the right hip, though this does not appear in Richardson's figure; foot broad and well-haired. He describes an individual as having the face, muzzle, belly, and legs white; a dark patch over the eye, and on the back and sides, larger patches of dark blackish gray or lead color, mixed with fawn and white. Ears white in front, the backs yellowish gray or fawn; tail white beneath and at the tip.

Notes.— It seems probable that this small breed was lost in the early part of the last century. At all events, writers subsequent to Richardson do not seem to have met with it, and those that mention it, seem to have confused it with the Common Indian Dog. Thus B. R. Ross (1861) and Macfarlane (1905, p. 700) clearly had in mind a different animal; and a skull sent by the latter to the U. S. N. M. as *lagopus* (from Fort Simpson, Mackenzie River) is a large dog, evidently the Common or Larger Indian Dog. Hamilton Smith (1840, p. 131) takes his description in part from Richardson, and mentions a pair of these dogs as then living in the Zoölogical Society's Gardens at London. Audubon and Bachman likewise are indebted to Richardson for their account, though their figure, by J. W. Audubon, is said to be from a stuffed specimen, perhaps one of those previously living in the Zoölogical Society's Gardens. The dimensions they give however, seem rather large.

Richardson says further that it was used solely in the chase and was probably too small to serve as a burden carrier. Its voice was a wolf-like howl, but at some unusual sight it would make a singular attempt at barking, commencing with a peculiar growl and ending in a prolonged howl.

Here may be mentioned what seems to be an unknown or vanished breed of dogs as indicated in the account of Frobisher's voyage to Arctic America in 1577. At the present Frobisher Bay, in southeastern Baffin Land, the expedition found in addition to the large dogs used for sledging, a smaller breed, which was apparently used only as food, and allowed the freedom of the skin tents of the Eskimos. The historian of the expedition writes that they "found since by experience, that the lesser sort of dogges they feede fatte, and keepe them as domesticall cattell in their tents for their eating, and the greater sort serve for the use of drawing their sleds." At York Sound, the same writer relates that on going ashore to examine "certaine tents of the countrey people," they "found the people departed, as it should seeme, for feare of their comming. But amongst sundry strange things which in these tents they found, there was rawe and new killed flesh of unknowen sorts, with dead carcasses and bones of dogs" (Hakluyt's Voyages, Everyman's Library, ed. **5**, p. 212, 215). Concerning this "lesser sort of dogges," nothing further seems to be known, whether they were a dwarf variety of the Eskimo dog, or as seems likely, a small breed similar to those of the Hare Indians or of other tribes of the mainland.

FUEGIAN DOG.

Plate **4**, fig. 2.

Characters.— Size small, as large as a terrier, muzzle slender, ears large, delicate, and erect, body and limbs well-proportioned, shoulders higher than rump; tail long, drooping, slightly recurved at the tip and well-fringed; feet webbed; color uniform grayish tan, or often with patches of black or tan, and areas of white; inside of the mouth dark-pigmented.

Distribution.— Found chiefly among the "Canoe Indians" — Yahgans and Alacalufs — of the Fuegian Archipelago, from Cape Horn to Beagle Channel, and northwestward, probably at least to the western part of Magellan Strait.

Descriptions.— The best account of the Fuegian Dog is that given by d'Herculais (1884) of two Yahgan Dogs brought back to France by Dr. Hyades of the Mission scientifique au Cap Horn (expédition de la ROMANCHE), in 1883. These were obtained as puppies from the Yahgans at Orange Bay and grew up to be tame and affectionate dogs. They are described as small but well-proportioned, remarkable for their large pointed and erect ears, and very sharp slender muzzles. The color-pattern is very variable, often a uniform grayish tan recalling the jackal; again, the body is marbled with extensive black or tan areas on a white ground. The feet are plainly webbed. The two dogs above referred to, were said to measure, the male and female respectively:— height at shoulder, 49 and 44 cm.; length from tip of nose to root of tail, 80 and 72 cm.; length of tail, 26 and 23 cm.

External Measurements. — Dechambre (1891) in a note on these same dogs, gives the following dimensions, evidently of a female:—

Scapuloischial length	52	cm.
Height at shoulder	41	"
Height at rump	39	"
Height at axilla	25	"
Thoracic perimeter	58	"
Distance between ears	9	"
" " inner corners of eyes	4.5	"
" " outer " " "	8.5	"
Breadth of forehead	11	"
Length of head	22	"
" " muzzle	9	"
Interorbital width at outer corner of eye	9.5	"

The further description by Dechambre supplements that of d'Herculais based on the same individual. He describes its fox-like head with pointed muzzle, broad forehead, its erect and high-set ears, usually directed forward, very mobile; eyes slightly oblique. The body is large, limbs slender, the neck short and powerful, the shoulders slightly higher than the rump; tail bushy and carried high. Pelage with a short under fur, pied black and white, passing to slaty at the throat, clouded with tan; over each eyebrow a white spot with a few fulvous hairs. The coat has the appearance of a domesticated animal in its pattern.

Captain Fitzroy of the BEAGLE, in a letter to Hamilton Smith (1840, p. 214) describes these dogs of the 'Canoe Indians' as resembling "terriers, or rather a mixture of fox, shepherd's dog, and terrier. All that I examined had black roofs to their mouths, but there was much variety in the colours and degrees of coarseness of their coats. * * * Many Fuegian dogs are spotted and not a few have fine short hair, but all resemble a fox about the head. * * * One brought from Tierra del Fuego was white with one black spot, and very handsome; his size was about that of a terrier, his coat short but fine, and his ears extremely delicate and long, although erect;" the muzzle also is long, the tail rough and drooping.

Skull and Limb-bones.— In a recent paper, Professor Lönnberg (1919) has given what appear to be the first published figures and measurements of the limb-bones and skull of this dog. His specimen was a skeleton obtained by Nordenskjöld in 1895–96 during his Tierra del Fuego expedition. As this author demonstrates, the skull is that of a true dog, and shows no relationship with the native canid, *Pseudalopex lycoides.* A comparison of the cranial measurements with those given for the Techichi of North and South America, shows a very close approximation, amounting almost to identity. The first lower molar in the Fuegian Dog seems smaller, however, 16.5 mm. in Lönnberg's specimen against 17.5 to 18.5 mm. in the more northern dogs. For better comparison, the following measurements of the Fuegian Dog are reproduced from this paper (Lönnberg, 1919, p. 11):—

Condylo-incisive length	141	mm.
Length of palate	71.3	"
Front of canine to back of m^2	64	"
Length of premolar^4	15.2	"
Length of upper premolar-molar series	51	"
Width of palate outside m^1	52.6	"
Zygomatic width	81	"
Length of nasals mesially	46	"
Length of lower m_1	16.5	"
Length of humerus	105	"
Length of ulna	125	"
Length of femur	132	"
Length of tibia	139	"

Uses.— The Fuegian Dog is active and strong in proportion to its small size; quiet, faithful to its master, and able to withstand much privation; vigilant and extremely sly. It is capable of barking like the European dogs.

They are of invaluable service to their masters in hunting, particularly in the pursuit of otters (*Lutra felina*), which are assiduously sought. Indeed Fitzroy wrote that "it is well ascertained that the oldest women of the tribe are sacrificed to the cannibal appetites of their countrymen rather than destroy a single dog. 'Dogs,' say they 'catch otters; old women are good for nothing.'" They are vigilant watch-dogs, barking furiously at a stranger. Their small size, and consequent adaptability as canoe companions, are no doubt the chief cause for their preference by the Canoe Indians of the west Patagonian Archipelago, over the larger dogs found among the so-called Foot Indians of the mainland and the eastern and inland parts of Tierra del Fuego.

Remarks.— In the absence of specimens for comparison, it is not altogether clear that the Fuegian Dog can be satisfactorily distinguished except in minor particulars from the Techichi or Alco of Peru and Mexico. Molina apparently thought it identical. In general it appears closely similar, but perhaps of more slender build, a bushier tail with recurved tip, well-palmated feet and a shaggier coat, though Fitzroy speaks of variation in this last character.

In his Bibliography of the Fuegian tribes, Cooper (1917, p. 186) has summarized the references to dogs in the literature referring to these people. As early as 1557, or perhaps 1553, the Chonos at the northern end of the Chilian Archipelago, were credited with having dogs, as appears from Goicueta on the authority of Cortés Hojea. The first mention of dogs in the Strait of Magellan appears to be that of Narbrough, who in 1670, found the natives of the Elizabeth Islands in possession of large mongrel dogs of several colors. He compared them to the race of Spanish dogs he had found among the Patagonians of Port Julian. Probably these were not of native stock. Twenty-six years later de Gennes saw five or six small dogs among the Alacalufs of Port Famine. The Mánekenkn met by the first Cook expedition in 1769 at Good Success Bay, southeast end of Tierra del Fuego, had dogs about two feet high with sharp ears; they all barked. The small dog here described is apparently found among the so-called Canoe Indians of the western archipelago, the Yahgans and Alacalufs, the most southerly tribes of men in the world.

SHORT-NOSED INDIAN DOG.

Plates **6**, **11**.

1885. *Pachycyon robustus* J. A. Allen, Mem. M. C. Z., **10**, 13 pp., 3 pls.

1885. *Canis ingae vertagus* Nehring, Sitzb. Gesellsch. naturf. freunde Berlin, p. 5–13 (not *Canis familiaris vertagus* Linné, Syst. nat., 12th ed., 1766, **1**, p. 57.

Characters.— A stoutly built dog, the size of a small terrier, with erect ears, short heavy muzzle, high forehead, short body and limbs, well-developed tail.

The color seems to have been black and white; sometimes more uniformly black, or yellowish with dark blotches.

The skeleton is stoutly proportioned, the limb-bones short and thick, the humerus with a very small or no olecranal perforation. The sagittal crest is chiefly developed at the occiput. Correlated with the slight reduction of the maxillary bones, and the widening of the palate, is the fact that the last molar is placed just in advance of a transverse line through the posterior boundary of the palate.

Distribution.— Skeletal remains of this peculiar small dog have been found in Virginia in a superficial cave-deposit, as well as in the shell-mounds of San Nicolas Island on the coast of southern California. A well-preserved dried or mummified example was lately discovered by Mr. S. J. Guernsey in a burial antedating the Cliff Dwellers, in the Marsh Pass region of Arizona; and Reiss and Stübel have discovered its mummified remains in the prehistoric necropolis of Ancon, Peru (see Nehring, 1884b). In the M. C. Z. is a humerus lacking the epiphyses, of a young specimen from Pecos, New Mexico, obtained by Dr. A. V. Kidder. These localities may be taken as limiting the known extent of its distribution.

Notes.— In 1885, Dr. J. A. Allen described as a new genus and species *Pachycyon robustus*, an extinct type of dog from Ely Cave, Lee County, Virginia, basing his account upon a pelvis, a femur, a tibia, a scapula, and a humerus of which he publishes excellent illustrations. These bones were obtained in the course of excavating the superficial layer of earth on the cave-floor, and though it is not certain exactly at what point they were found, no excavations deeper than a foot were made. Remains of Indian occupation were numerous, and other bones were obtained in the cave. There is nothing to indicate great age in the type-specimens (M. C. Z. 7,091); indeed the bones are quite fresh in appearance, only slightly discolored with earth. They are chiefly notable for their small size and rather heavy ungraceful proportions, while the humerus is particularly marked on account of its lacking the usual perforation over the middle of the epicondyle. This perforation is almost always present in Eurasian dogs, as well as in coyotes and wolves. No further light has since been shed on the nature of this animal nor have any parts of its skull been found.

Among the remarkable discoveries made by Mr. S. J. Guernsey in the course of archaeological exploration in the Marsh Pass region of

Arizona for the Peabody Museum, were the dessicated remains of two dogs with human burials of an age apparently antedating the culture of the Cliff Dwellers. One of these dogs is small, about the size of a Fox-terrier but more compactly and heavily built, with a shorter head, erect ears, and longer tail. It still shows a black and white pattern, with a narrow median white line from nose to forehead, a white chin, throat, and belly, a white collar, white feet, and tail tip. Much of the body is black. In the length of the limb-bones and pelvis as nearly as can be determined from careful study of the dried and mummified specimen, it corresponds exactly with Pachycyon. By making incisions through the dried tissue at the elbow, it was possible to lay bare the olecranal cavity above the joint where the large perforation is usually present. It was found that in the right humerus a small perforation was present, about 3 mm. in diameter, while in the left humerus there were merely two small pores side by side. The animal was young, still retaining a milk incisor, and so it is likely that had it been as old an individual as the one whence the type-bones of Pachycyon were derived, these foramina would have ossified completely, perhaps leaving, as in the type-humerus, a shallow pit in the posterior side of the olecranal fossa, as an indication of the former perforation. So complete is the correspondence of the bones of Pachycyon with those of this prehistoric dog of Arizona that they may be unhesitatingly pronounced those of a similar if not identical breed of Indian dog.

Not less interesting is a comparison of the humerus of Pachycyon with a humerus figured by Nehring (1884b, Plate **118**, fig. 4, 4a) from a mummified dog exhumed with human-mummies in the ancient necropolis of Ancon, Peru. In measurements, there is practical identity as shown in the following table (the measurements of the Ancon humerus are taken directly from Nehring's figure, of natural size): —

	Pachycyon	Ancon
Greatest length of humerus	97 mm.	97 mm.
Greatest diameter through head of humerus	31.5	29.5
Transverse " " " " "	21	24
Transverse diameter of distal end of same	25	25

Nehring's figure shows substantially the same type of thick stout humerus, and as he remarks, has the further peculiarity of lacking any trace of perforation of the olecranon fossa. It should be added that the humerus, shown in his figure is nevertheless very slightly more bowed than that of the type of Pachycyon, and in his opinion the Peruvian Dog corresponded closely to a European Turnspit or Dachshund, whence he calls it *Canis ingae vertagus*. The figures of the skull of the same specimen likewise show an apparent similarity in outline and proportions to that of the Arizona mummy.

There seems thus to be no doubt that *Pachycyon robustus* is after all only a breed of dog cultivated by the Indians of the southern parts of North America and of Peru. It is therefore no longer to be thought of as a problematical mammal of the Pleistocene.

Among the dog-bones obtained by the University of California's investigations of the Indian shell-mounds on San Nicolas Island, off the coast of southern California, are two crania nearly identical in measurements with the Marsh Pass specimen that appear to represent this same small, short-nosed dog. They are characterized by their broad brain-cases, spreading zygomata, wide palates, shortened rostra, and small teeth. In profile the dorsal outline of the brain-case is gently rounded, not flat. The shortness of the rostrum does not amount to real deformity however, for the lower jaw closes normally into its place and the premolars are not markedly crowded, though p^3 is turned at an angle of nearly 30° from the axis of the skull to adapt its position to the sudden narrowing of the skull at this point. Premolars 1 and 2 are normal in position, and there is a short diastema between p^1 and the canine. The ossification seems particularly heavy, yet though old, neither skull has developed a sagittal crest except at the interparietal region. In the dried mummy from Marsh Pass, the shortened nose and elevated forehead give a characteristic appearance to the head which is evident in these crania as well. No limb-bones that can be assigned to this dog, have appeared among the Californian collections. In both crania the opening of the posterior nares is narrow, and a transverse line drawn at right angles to the cranial axis at the posterior end of the palate falls *behind* the last molar, indicating deviation from the normal condition.

The following skull-measurements show close agreement. One of the Californian crania ($\frac{1}{16355}$) lacks any trace of the alveoli of m^2 which are partly broken and partly resorbed. The first premolar is wanting also. The proportions of the maxilla are, however, practically the same in both specimens. The Ancon specimen is figured by Nehring (1884b) of natural size and the measurements are taken from this figure. It too lacks the first upper premolar, and in every respect conforms to the appearance of the other crania.

Measurements of the Skull	Peru: Ancon	Ariz.: Marsh Pass	$\frac{1}{16,355}$ Calif.	$\frac{1}{16,356}$ Calif.
Greatest length, occiput to median incisor (alveolus)	141	?132	138	138
Greatest length, edge of foramen magnum to median incisor	—	—	123	121
Median incisor to edge of palate	—	—	68	68
" " " orbit (anterior edge)	55	—	54	54
" " " m^2 (alveolus)	72	71.5	69	—
Canine " m^2 "	59	60	59	—
Premolars $^{1-3}$ (alveoli)	—	22	20	—
Length of premolar ^{4}	16	16	—	17
Molars $^{1-2}$ (alveoli)	16.5	—	16	—
Width of palate outside m^1	—	—	56	56.5
" " " " p^3	—	39	42	39
Zygomatic width	—	—	87	85
Mastoid width	—	—	54	53
Width of occipital condyles	—	—	30	31
Nasals, length	—	—	—	41

In addition to the limb-measurements given on p. 497, the Arizona mummy gives the following:— total length from tip of nose to tip of tail following curve of back, 705 (*circa*); tail about 195; ulna 120 (*circa*); carpus to end of longest claw 90; ear about 60–70 mm. long including hair; tail 195; femur 106 (*circa*); tibia 116 (*circa*); hind foot 122.

Remarks.— Although this type of dog seems to have been widespread among the aborigines of southern North America and northeastern South America, it appears to have quite disappeared and is not clearly identifiable in any of the accounts of the early writers. Mr. Guernsey's discovery of a well-preserved mummy in a burial of considerable age in Arizona, has confirmed my previous identification of the Virginia bones of Pachycyon with those of Nehring's short-limbed dog-mummy of Ancon. The cranium is characterized by its breadth and stoutness, its shortened snout and high forehead, gently convex dorsal profile of the brain-case, and the small teeth (upper carnassial 16–17 mm.). The Californian crania agree substantially in every detail. Probably this is the same dog that Moore (1907, p. 423) discovered in Indian mounds on Crystal River, west Florida, of which Lucas observed, "the front of cranium of carnivore and jaws, are from the same animal, the short-faced dog something like a bull-terrier that seems to have been a favorite with the Indians of the southwest".

Peruvian Pug-nosed Dog.

Plate **12**.

1885. *Canis ingac molossoides* Nehring, Sitzb. Gesellsch. naturf. freunde Berlin, p. 5–13.

Characters.— Similar to the Short-nosed Indian Dog but with even shorter facial bones, an undershot lower jaw, broader zygomata and posterior narial passage. The increased shortening of the face causes a slightly more elevated forehead. The color seems to have been yellowish or whitish, marked or clouded with dark brown.

Distribution.— This Dog is known only from the Peruvian Highlands, where its remains have been found with ancient burials of the aborigines at Ancon and Pachacamac.

Skull-Characters.— A comparison of six skulls from Peru (loaned by the U. S. N. M.) with those of the Short-nosed Dog of North America, leaves little doubt that the Peruvian Pug-nosed Dog is derived from the latter, perhaps through some sort of cross-breeding, possibly as an occasional result of a particular cross, or through the dominance of its peculiarities in cross-bred animals. In most respects, the skulls of both are essentially alike, but the shortening of the rostral portion in the present breed is more pronounced, resulting in an undershot lower jaw. Yet the reduction of the maxillaries is not so extreme as to cause very great crowding of the premolars as in our Bull-dogs or the Pekinese Lap-dogs. Thus in two out of six crania, the third premolar is set almost transversely to the long axis of the skull, but in the others it retains about the usual relation. The second premolar, in two cases, is turned inward at more than the usual angle. In only one of the six skulls is the first upper premolar missing, and here on the left side only.

The opening of the posterior nares is very wide in comparison with the common Short-nosed Dog, and the zygomatic arches are broader. In none of the six skulls do the temporal ridges unite to form a median crest except at the occiput along the interparietal bone. On account of the shortening of the facial bones, the forehead is high, with a deep and broad groove medially. A further result of this shortening is the greater upward turn of the palate, best seen when the crania are on a flat surface. The palate of the Pug-nosed Dog, makes an angle with the table of about 27° against about 15° in the case of the longer-nosed breed. The same rugose surface of the brain-case, the *heaviness of bone* and the *thickened prominences* at each side of the posterior narial openings, characteristic of the Inca Dog, are seen in this breed as well.

No limb-bones have been obtained that can be referred to this dog, but it is likely that they were short and thick like those of the related breed.

The following table gives dimensions of the six skulls in the U. S. N. M. and is interesting for comparison with those of the Short-nosed Indian Dog.

Measurements of the Skulls	U. S. N. M.					
	172,885	172,883	172,886	172,887	172,884	176,307
Occipitorostral length (excluding incisors)	124	—	138	138	142	145
Basal length	104	—	121	125	119	125
Palatal length	60	—	65	67	67.5	66
Orbit to tip of premaxillary	47	—	49	52	53	53
Upper tooth-row	64	—	—	—	—	—
“ “ (alveoli)	60	—	68	61	69	69
Front of canine to back of molar ^{2} (crowns)	—	—	—	—	58	—
Front of canine to back of molar ^{2} (alveoli)	49	53	57	58	57	56.5
Length of premolar^4 (crown)	16	16	15.5	16.5	17.5	16.5
“ “ “ (alveolus)	15	15	14.5	15	16	15
“ “ molars$^{1-2}$ (crowns)	16.5	16.5	15.5	17.5	—	17
“ “ “ (alveoli)	16.5	15.5	14	15.5	17	16.5
Lower tooth-row (alveoli)	—	—	—	—	—	81
Zygomatic width	91	102	109	94	97	102
Breadth of occipital condyles	27	27	30	29	28	31.5

Remarks.— The existence of this breed of aboriginal dogs with shortened face and undershot, bull-dog-like jaw, was first discovered by Reiss and Stübel in the course of their investigation of the necropolis of Ancon, Peru. Nehring (1885) published an account of their discovery and gave the Latin name *Canis ingae molossoides* to the breed. At first but a single specimen was found among numerous other dog remains, but further search brought a few more to light, and more recently the Yale-National Geographic Society Expedition has recovered several skulls, from Huacho and Pachacamac.

The presence of this pug-nosed dog among the ancient Peruvians is doubly interesting, not only in that this variation should have occurred here, apparently quite independent of similar cases in the Old World, but in that it should have been preserved, whether through accident, or as supposed, through purposeful selection. Such a shortening of the face through the imperfect development of the bones of the rostrum is found occasionally in other domesticated mammals. The short-faced Cheshire Hogs and similar breeds furnish like instances of the selection and preservation of this mutation, which appears to be definitely heritable. Among undomesticated species, the case of a European Fox is recorded by Dönitz (1869) in which the rostrum was shortened abnormally, producing a bull-dog-like appearance, with undershot jaw. The second and third premolars of the upper jaw were opposite the third and fourth respectively of the lower jaw, while the upper canine fitted into a space between the first and second lower premolars. Schmitt (1903) agrees with Studer (1901) that such cases are due to the retention of embryonic conditions but considers them to be a result of domestication. This, however, is not necessarily the case, as the above instance shows. The case of a "bull-dog-headed calf" is recorded by Warren (1910) as having appeared as a "sport" variation.

Notwithstanding the comparatively high cultural development of the Incas, it may be doubted whether they purposely bred these dogs for their peculiarity of face. Quite as likely the anomaly arose, perhaps as a frequent result of cross-breeding between certain of the other canine races, or as a local abnormality, which as a Mendelian character, frequently cropped out in chance crosses. This may be indicated by the apparent rarity of this type of dog in the Ancon burials, and by the considerable variation in slight details of the form of the skull, as if no special type were bred for.

An interesting anomaly of an opposite nature is worth recording in this connection, namely that of a Jackal shot by Dr. J. C. Phillips in Arabia (M. C. Z. 15,872) in which the *under* jaw has failed to reach its normal length and is overshot by the upper jaw. The lower canine closes *behind* the upper instead of anterior to it as in normal cases.

SUMMARY.

Recent careful studies of the teeth indicate that the domestic dog's relationship is with the wolves rather than with the groups of canids represented by coyote, jackal, or fox. The ultimate wolf-like ancestor of the dog is yet to be determined, but present evidence favors the view that it was not one of the large circumboreal wolves, but possibly a distinct and smaller species, from which both large and small breeds of dogs have been derived.

The domestic dogs of the American aborigines were quite as truly typical dogs as those of Asia, and may be assumed to have reached America from that continent, with their human companions. Although it is possible that the larger dogs may interbreed occasionally with wolf or coyote, there is no good reason to suppose that such crossing has had much if any, influence on the original stock.

In a very general way, three types of dogs may be distinguished among the American aborigines: (1) the large, broad-muzzled, Eskimo Dog, with heavy coat and tail curled forward over the hip; (2) a larger and (3) a smaller Indian Dog, from which are probably to be derived several distinct local breeds. Of the larger style of dog as many as eleven varieties may perhaps be distinguished; of the smaller, five.

An interesting and suggestive parallel is found among prehistoric European dogs, of which in late Neolithic and early Bronze periods there were a large and a small type — *Canis intermedius* and *C. palustris* — corresponding rather closely to the Larger or Common Indian Dog and the Small Indian Dog or Techichi. The obvious probability is that these two general types of dogs were then widely cultivated in Asia, and at a very early period reached Europe and America with the human immigrants. In a similar way the Eskimo Dog is of a type common to northern Asia and Europe, and doubtless reached America with the Eskimos, whose arrival, at least in eastern America is usually regarded as relatively recent.

BIBLIOGRAPHY.

Acconci, L.

1880. Continuazione dello studio dei resti fossili rinvenuti nella caverna di Cucigliana. Ordine dei carnivori: famiglia dei Canidi. Atti Soc. Tosc. sci. nat. Pisa, Proc. verb., **2**, p. 41-42.

Acosta, J. de.

1590. Historia natural y moral de las Indias, etc. Sevilla, 8vo, 536 pp. and index.

Allen, J. A.

1885. On an extinct type of dog from Ely Cave, Lee County, Virginia. [With a note] on the age of the Ely Cave by N. S. Shaler. Mem. M. C. Z., **10**, 13 pp., 3 pls.

Anderson, R. J.

1901. Abnormal dentition in the dog. Irish nat., **10**, p. 89–90.

Anutschin, D. N.

1881. [Ueber die Hunderassen der Steinperiode an den Ufern des Ladogasees]. 5th Archäol. congr. Tiflis. (Russian).

1882. [Zwei Rassen des Hundes aus dem Torfmooren des Ladogasees]. Moskou. (Russian). See Arch. anthrop., 1882, **14**, p. 333.

Audubon, J. J., and Bachman, J.

1849–54. The quadrupeds of North America. New York, 8vo, 3 vols., illus.

[Bancroft, Edward].

1769. An essay on the natural history of Guiana. London.

Bannister, H. M.

1869. The Esquimaux dog. Amer. nat., **3**, p. 522–530.

Bartlett, A. D.

1890. Observations on wolves, jackals, dogs, and foxes. Proc. Zool. soc. London, p. 46–48.

Barton, B. S.

1805. Some account of the different species and varieties of native American, or Indian dogs. Barton's Med. and phys. journ., **1**, pt. 2, p. 3–31.

Bartram, William.

1792. Travels through North and South Carolina, Georgia, east and west Florida, etc. London, 8vo., illus.

Baudouin, M.

1910. Le chien en préhistoire. Bull. Soc. préhist. de France, **7**, p. 314–316.

Blainville, H. M. H. Ducrotay de.

1841. Ostéographie ou déscription iconographique comparée du squelette et du système dentaire des cinq classes d'animaux vertébrés récents et fossiles pour servir de base à la zoologie et à la géologie. Mammifères, Carnassiers, vol. 2. Paris, 4to, illus.

Blanford, W. T.

1877. [Professor Jeitteles' researches on domestic dogs]. Proc. Asiatic soc. Bengal, p. 114–117.

Boule, Marcellin.

1889. Les prédécesseurs de nos canidés. Compt. rend. Acad. sci. Paris, **108**, p. 201–203.

Bourguignat, J. B.

1875. Recherches sur les ossements de Canidae constatés en France à l'état fossile pendant la période quarternaire. Ann. sci. géol., **6**, art. 6, 60 pp., pl. 16–18.

Brown, Robert.

1868. On the mammalian fauna of Greenland. Proc. Zoöl. soc. London, p. 330–362.

1875. The same, reprinted, with corrections and annotations by the author. 34 pp.

Browne, Patrick.

1789. The civil and natural history of Jamaica. London, 4to.

Burton, L. A.

1917. Raising wolf dogs. Forest and stream, **87**, p. 448.

Catlin, George.

1841. Letters and notes on the manners, customs, and condition of the North American Indians. 8vo., 2 vols., illus.

Children, J. G.

1827. On the Esquimaux dog. Zool. journ., **3**, p. 54–56, pl. 1.

Colenso, William.

1878. Notes, chiefly historical, on the ancient dog of the New Zealanders. Trans. and proc. New Zealand inst., **10**, p. 135–155.

Cooper, J. M.

1917. Analytical and critical bibliography of the tribes of Tierra del Fuego and adjacent territory. Bull. 63, U. S. bur. Amer. ethnol.

Cope, E. D.

1879. On the genera of Felidae and Canidae. Proc. Acad. nat. sci. Phila., p. 168–194.

1879a. The Japanese Lap Dog (*Dysodus pravus*). Amer. nat., **13**, p. 655–656.

1883. On the extinct dogs of North America. Amer. nat., **17**, p. 235–249, fig. 1–14.

1887. The pug-dog and the Chihuahua dog. Amer. nat., **21**, p. 1125–1126.

1893. [On a jaw of an Indian dog] in C. B. Moore's Certain shell heaps of the St. John's River, Florida, hitherto unexplored. Amer. nat., **27**, p. 614, 3 figs.

Cope, E. D., and Wortman, J. L.

1884. An account of the mammalian fauna of the Postpliocene deposits, in the state of Indiana. 14th ann. rept. state geol. Indiana, pt. 2, p. 4–62, pl. 1–6. (See p. 8, footnote).

Coues, Elliott.

1873. The prairie wolf, or coyoté: *Canis latrans.* Amer. nat., **7**, p. 385–389.

1876. Reversion of the dog to the feral state. Forest and stream, **7**, p. 213.

Cunningham, R. O.

1871. Notes on the natural history of the Strait of Magellan and west coast of Patagonia made during the voyage of H. M. S. '*Nassau*' in the years 1866, 67, 68, 69. Edinburgh, 8vo., illus.

Cuvier, F.

1808. Observations sur le chien des habitans de la Nouvelle-Hollande, précédées de quelques réflexions sur les facultés morales des animaux. Ann. Mus. d'hist. nat. Paris, **11**, p. 458–476.

1810. Recherches sur les différences d'organisation qui existent entre les races des chiens domestiques. Nouv. bull. des sci. Soc. philom. Paris, **2**, p. 185–187.

1811. Recherches sur les caractères ostéologiques qui distinguent les principales races du chien domestique. Ann. Mus. d'hist. nat. Paris, **18**, p. 333–353, pl. 18–20.

Dechambre, Paul.

1891. Note sur les chiens de la Terre de Feu. Mission sci. du Cap Horn, 1882–1883, **7**, p. 391–392.

1894. Race canine. Classification et pointage. Mém. Soc. zool. France, **7**, p. 331–362.

Dönitz, ——.

1869. [Ueber eine monströse schädelbildung eines fuchses aus Schlesien]. Sitzb. Ges. naturf. freunde Berlin, 1868, p. 20–21.

Duerst, J. U.

1904. Die tierwelt der ansiedelungen am schlossberge zu burg an der Spree. Arch. anthrop., new ser., **2**, p. 233–294, pl. 16–20.

Dugés, Alfredo.

1882. El perro de Chihuahua. La naturaleza, **5**, p. 14–17, fig. 1–3.

Eastman, C. R.

1916. Hunting-dogs of the Ancients. Amer. mus. journ., **16**, p. 403–408, 6 figs.

Eaton, G. F.

1898. The prehistoric fauna of Block Island [R. I.], as indicated by its ancient shell-heaps. Amer. journ. sci., ser. 4, **6**, p. 137–159, pl. 2, 3.

1916. The collection of osteological material from Machu Picchu. Mem. Conn. acad. arts and sci., **5**, 96 pp., 39 pls., 2 tables, map.

Eiffe, O. E.

1909. Kreuzung von polarhund und Dingo. Zool. beobachter (Zool. garten), **50**, p. 312–313.

Ermel, Alexander.

1889. Eine reise nach der Robinson-Crusoe-Insel. Hamburg, 8vo, 134 pp., 11 pls., map.

Filhol, Henri.

1883. Observations relatives aux chiens actuels et aux carnassiers fossiles s'en rapprochant le plus. Arch. Mus. d'hist. nat. Lyon, **3**, p. 70–97, pl. 5.

Fischer, J. B.

1829. Synopsis Mammalium. Stuttgart, 8vo.

Fitzinger, L. J.

1866. Untersuchungen über die abstammung des hundes. Sitzb. K. akad. wiss Wien, math.-nat. cl., **54**, pt. 1, p. 396–457.

1867. Die raçen des zahmen hundes. Sitzb. K. akad. wiss. Wien, math.-nat. cl., **56**, pt. 1, p. 377–507, 514–585, 776–823.

Gervais, Paul.

1875. Remarques au sujet du chien domestique. Journ. zool., **4**, p. 119.

Gibbs, George. See **Suckley, G.**, and

Gidley, J. W.

1913. Preliminary report on a recently discovered Pleistocene cave deposit near Cumberland, Maryland. Proc. U. S. N. M., **46**, p. 93–102, fig. 1–8a.

Glahn, H. C.

1784. Om den Grønlandske hund. Nye samlung, K. Norske vid.-selsk. skr. Trondhjem, **1**, p. 485–496.

Gray, J. E.

1867. On the skull of the Chinese pug-nosed spaniel or lap-dog. Proc. Zool. soc. London, p. 40–43, fig. 1–4.

1869. Note on the varieties of dogs. Ann. mag. nat. hist., ser. 4, **3**, p. 236–240.

Guyon, ——.

1866. Des animaux disparus de la Martinique et de la Guadeloupe depuis notre établissement dans ces îles. Compt. rend. Acad. sci. Paris, **63**, p. 589–597.

Hammeran, A.

1895. Zur geschichte der hunde-rassen. Zool. garten, **36**, p. 12–17, 53–59, 88–92, 110–117, 147–153.

Harlan, Richard.

1825. Fauna Americana: being a description of the mammiferous animals inhabiting North America. Philadelphia, 8vo.

Harmon, D. W.

1820. A journal of voyages and travels in the interior of North America, [etc.]. Andover, 8vo, 432 pp.

Harting, J. E.

1884. Dogs: ancient and modern. Zoologist, ser. 3, **8**, p. 393–411.

Hearne, Samuel.

1796. A journey from Prince of Wales's Fort, in Hudson's Bay, to the northern ocean . . . . in the years 1769 . . . .–1772.

Herculais, J. K. d'.

1884. Les chiens des Fuégiens. Science et nature, **1**, sem. 1, p. 137–140, fig.

Hernandez (*or Fernandez*), **Francisco.**

1651. Historiae animalium et mineralium Novae Hispaniae. Liber unicus in sex tractatus divisus. Rome, folio, 96 pp. (in Recchi and Lynceus, 1651).

Hilzheimer, Max.

1905. Variationen des canidengebisses mit besonderer berücksichtigung des haushundes. Zeitsch. morph. u. anthrop., **9**, p. 1–40, pl. 1–5.

1908. Beitrag zur kenntnis der nordafrikanischen schakale nebst bemerkungen über deren verhältnis zu den haushunden, insbesondere nordafrikanischen und altägyptischen hunderassen. Zoologica, **20**, no. 53, 111 pp., 4 tables, 10 pls.

Hind, H. Y.

1859. North-west territory. Reports of progress; together with a preliminary and general report on the Assiniboine and Saskatchewan exploring expedition, made under instructions from the Provincial Secretary, Canada. Toronto, 4to, illus.

Holland, W. J.

1908. A preliminary account of the Pleistocene fauna discovered in a cave opened at Frankstown, Pennsylvania, in April and May, 1907. Ann. Carnegie mus., **4**, p. 228–233, pls. 57, 58.

Hollard, ——.

1859. Nouvel exemple de croisement fécond du *Canis lupus* et du *Canis familiaris.* Compt. rend. Acad. sci. Paris, **48**, p. 1072–1073.

Hué, E.

1906. [On *Canis le mirei*, a neolithic dog from Jura]. Bull. Soc. préhist. de France. (Not seen).

Hunter, John.

1787. Observations tending to shew that the wolf, jackal, and dog, are all of the same species. Phil. trans. Roy. soc. London, **77**, p. 253–266.

1789. A supplementary letter on the identity of the species of the dog, wolf, and jackal. Phil. trans. Roy. soc. London, **79**, pt. 1, p. 160–161.

Hutton, F. W.

1898. Note on the ancient Maori dog. Trans. and proc. New Zealand inst., **30**, p. 151–155, pl. 15.

Huxley, T. H.

1880. On the cranial and dental characters of the Canidae: Proc. Zool. soc. London, p. 238–288.

Hyades, P. and Deniker, Joseph.

1891. Mission scientifique du Cap Horn. 1882–1883. **7.** Anthropologie, Ethnographie. Paris, 4to, illus.

Ihering, Hermann von.

1913. Le chien domestique des Calchaquis. Revista Mus. de La Plata, **20**, p. 101–106, 3 figs.

Jeitteles, L. H.

1872. Die vorgeschichtlichen alterthümer der stadt Olmütz und ihrer

Umgebung. Mitth. Anthrop. ges. Wien, **2**, p. 18–32, 53–62, 86–91, 130–136, 162–182, 211–224, 233–247, 278–288, 1 pl.

1877. Die stammväter unserer hunde-rassen. Wien. (See also Arch. f. naturg., 1877, **43**, pt. 2, p. 80).

Jentink, F. A.

1897. The dog of the Tengger. Notes Leyden mus., **18**, p. 217–220, pl. 4, 5.

Keller, Conrad.

1904. Zur abstammungsgeschichte unserer hunde-rassen. Eine abwehr gegenüber Herrn. Prof. Th. Studer. Vierteljahrsschr. d. Naturf. ges. Zurich, **48**, p. 440–457.

Keller, Otto.

1909. Die antike tierwelt. Leipzig, 8vo, illus.

1912. Die herkunft der europäischen haustierwelt. Verh. 8 Int. zool.-kongr., p. 356–365.

Köhler, E. M.

1896. Hunderassen Chinas und der Mongolei. Zool. garten, **37**, p. 257–263.

Kohn, F. G.

1911. Beitrag zur kenntnis der haut der nackthundes. Zool. jahrb. Anat., **31**, p. 427–438, pl. 16.

Krefft, Gerard.

1866. On the vertebrated animals of the Lower Murray and Darling, their habits, economy, and geographical distribution. Trans. Phil. soc. N. S. Wales, **1**, p. 1–33.

Kreyenberg, ——.

1910. Chinesische hunderassen und chinesische jagdhunde. Zool. beobachter (Zool. garten), **51**, p. 289–292.

Kühn, Julius.

1887. Fruchtbarkeit der bastarde von schakal und haushund. Zool. garten, **28**, p. 161–163.

Kulagin, Nicolaus.

1892. Mittheilung über die hunderasse Laika (Eskimohunde) in Russland. Zool. jahrb. Syst., **6**, p. 435–441, pl. 20.

Kunstler, J., and Chaine, J.

1906. Anomalie dentaire du chien. Procès-verb. séances Soc. sci. phys. et nat. Bordeaux for 1905–1906, p. 26–27.

Lambe, L. M.

1907. Note on the occurrence of a supernumerary tooth in a dog. Ottawa nat., **21**, p. 25–26, fig.

Landois, Hermann.

1883. Ueber ein anatomisches unterscheidungsmerkmal zwischen haushund und wolf. Morph. jahrb., **9**, pt. 1, p. 163–165.

Langkavel, Bernh.

1892. Ueber Dingos, Pariah-und neuseeländische hunde. Zool. garten, **33**, p. 33–38.

1899. Dogs and savages. Ann. rept. Regents Smithson. inst. for 1898, p. 651–675 (transl. from Intern. arch. ethnogr., **8**, p. 109–149).

Lataste, Fernand.

1888. La première prémolaire du chien est-elle monophysaire ou diphysaire? Le naturaliste, ser. 2, **10**, p. 20–22.

LeConte, John.

1856. Notice of American animals, formerly known, but now forgotten or lost. Proc. Acad. nat. sci. Phila., **7**, p. 8–14.

Lendenfeld, Robert von.

1889. Bilder aus dem australischen urwald. IV. Der Dingo. Zool. garten, **30**, p. 43–49, fig.

Lesèble, L.

1890. Les dingos au chenil du Jardin zoologique d'acclimatation. Rev. sci. nat. appliquées. Bull. mens. soc. nat. d'acclim. de France, **37**, p. 681–684.

Lewis, Meriwether, and **Clark, William.**

1905. Original journals of the Lewis and Clark expedition 1804–1806, etc. . . . edited by Reuben G. Thwaites. 8vo, 7 vols, illus.

Livermore, S. T.

1877. A history of Block Island, [R. I.] from its discovery, in 1514, to the present time, 1876. Hartford, Conn.

Lönnberg, Einar.

1919. Remarks on some South American Canidae. Arkiv zool., **12**, no. 13, 18 pp., 4 figs.

Loomis, F. B., and **Young, D. B.**

1912. On the shell heaps of Maine. Amer. journ. sci., ser. 4, **34**, p. 17–42, figs.

Lord, J. K.

1866. The naturalist in Vancouver Island and British Columbia. London, 8vo, 2 vols., illus.

Lortet, ——, and **Gaillard, C.**

1909. La faune momifiée de l'ancienne Égypte et recherches anthropologiques. Arch. Mus. d'hist. nat. Lyon, **10**, art. 2, 336 pp., 223 figs.

Lucas, F. A.

1897. A dog of the ancient Pueblos. Science, new ser., **5**, p. 544.

McCoy, Frederick.

1862. Note on the ancient and recent natural history of Victoria. Ann. mag. nat. hist., ser. 3, **9**, p. 137–150.

MacCurdy, G. G.

1914. The passing of a Connecticut rock shelter. Amer. journ. sci., ser. 4, **38**, p. 511–522, pl. 4.

MacFarlane, R.

1905. Notes on mammals collected and observed in the northern Mackenzie River district, Northwest Territories of Canada, with remarks on explorers and explorations of the Far North. Proc. U. S. N. M., **28**, p. 673–764, pl. 30–34.

Manners-Smith, J.

1902. Wolf hybrids in Gilgit. Journ. Asiatic soc. Bengal, **70**, pt. 2, p. 143–146.

Martinoli, C.

1908. Algunas observaciones sobre las anomalías dentarias del perro. An. Mus. nac. Buenos Aires, ser. 3, **9**, p. 459–469, table.

Mercer, H. C.

1897. An exploration of aboriginal shell heaps revealing traces of cannibalism on York River, Maine. Publ. Univ. Penna. philol., lit. and arch., **6**, p. 111–137, fig. 40–44.

Miller, G. S., Jr.

1912. Catalogue of the mammals of western Europe (Europe exclusive of Russia) in the collection of the British museum. London, 8vo, illus.

1912a. The names of the large wolves of northern and western North America. Smithsonian misc. coll., **59**, no. 15, 5 pp.

1916. Bones of mammals from Indian sites in Cuba and Santo Domingo. Smithsonian misc. coll., **66**, no. 12, 10 pp., 1 pl.

Mills, W. C.

1906. Baum prehistoric village. Ohio arch. and hist. publ., **15**, p. 44–136, 85 text-figs.

Mivart, St. George.

1890. Note on canine dental abnormalities. Proc. Zool. soc. London, p. 376–378, fig.

1890a. Dogs, jackals, wolves, and foxes: A monograph of the Canidae. London, 8vo, illus.

Mösch, O.

1906. Beitrag zur kenntnis des wolfes. Verh. Schweiz. naturf. ges. St. Gallen, **89**, p. 72–73.

Molina, J. I.

1808. The geographical, natural and civil history of Chile. Middletown, Ct., 2 vols., 8vo.

Moore, C. B.

1892–3. Certain shell heaps of the St. John's River, Florida, hitherto unexplored. Amer. nat., 1892, **26**, p. 912–922, pl. 24; 1893, **27**, p. 8–13, 113–117, 605–624, 708–723.

1894. Certain sand mounds of the St. John's River, Florida. Journ. Acad. nat. sci. Phila., ser. 2, **10**, p. 5–103, illus.

1896. Additional mounds of Duval and Clay Counties, Florida. Mound investigation on the east coast of Florida. Certain Florida coast mounds north of the St. Johns River. [Philadelphia; privately printed], 4to, 30 pp., 2 pls.

1897. Certain aboriginal mounds of the Georgia coast. Journ. Acad. nat. sci. Phila., ser. 2, **11**, p. 5–138, illus.

1899. Certain aboriginal mounds of the coast of South Carolina. Journ. Acad. nat. sci. Phila., ser. 2, **11**, p. 146–166.

1907. Crystal River revisited. Journ. Acad. nat. sci. Phila., ser. 2, **13**, p. 406–425, illus.

Mortillet, G. de.

1889. Le chien. Bull. Soc. d'anthrop., ser. 3, **12**, p. 425–448.

Morton, S. G.

1850. [On the antiquity of some races of dogs]. Proc. Acad. nat. sci. Phila., **5**, p. 85–89.

1851. [On American Indian dogs.] Proc. Acad. nat. sci. Phila., **5**, p. 139–140.

Nathusius, Hermann von.

1874. Bemerkungen über die schädel der Eskimohunde. Die zweite deutsche Nordpolar fahrt in den jahren 1869 und 1870, **2**, p. 175–177.

Nehring, Alfred.

1882. Ueber einige Canis-schädel mit auffälliger zahnformel. Sitzb. Ges. naturf. freunde Berlin, no. 5, p. 65–68.

1883. Ueber einige nachträglich an der stätte des Spandauer Bronzefundes zum vorschein gekommene menschliche und thierische reste. Zeitschr. ethnol., **15**, p. 357–359.

1884. Ueber eine grosse wolfsähnliche hunde-rasse der vorzeit (*Canis fam. decumanus* Nehring) und ueber ihre abstammung. Sitzb. Ges. naturf. freunde Berlin, p. 153–165.

1884a. Ueber Rassebildung bei den Inca-hunden aus den gräbern von Ancon. Kosmos (Zeitschr. ges. entw.-lehr.), **15**, p. 94–111, 3 text-figs.

1884b. Mammals. In Reiss and Stübel's Peruvian antiquities. The necropolis of Ancon in Peru, vol. 3, pt. 15, London and Berlin, folio.

1885. Ueber rassenbildung bei den Inca-hunden von dem todtenfelde bei Ancon in Peru. Sitzb. Ges. naturf. freunde Berlin, p. 5–13.

1885a. Ueber altperuanische hundemumien und ueber rassebildung bei den sogenannten Inca-hunden. Verh. Berlin. ges. anthrop., ethn. u. urgesch., p. 518–521.

1886. Ueber eine neue sendung mumificirter Inca-hunde von Ancon in Peru. Sitzb. Ges. naturf. freunde Berlin, p. 100–102.

1887. Ueber *Cuon rutilans* von Java und *Lupus japonicus* von Nippon. Sitz. Ges. naturf. freunde Berlin, p. 66–69.

1887a. Ueber die mumie eines langhaarigen Inca-hundes von Ancon in Peru. Sitzb. Ges. naturf. freunde Berlin, p. 139–141.

1887b. Zur abstammung der hunde-rassen. Zool. jahrb., **3**, p. 51–58.

1890. Ueber *Cuon alpinus fossilis* Nehring, nebst bemerkungen über einige andere fossile Caniden. Neues jahrb. min., pt. 2, p. 34–52, pl. 2.

Newcombe, C. F.

1909. Guide to the anthropological collection in the Provincial Museum. Victoria, B. C., 8vo, illus.

Noack, Th.

1887. Wolfbastarde. Zool. garten, **28**, p. 106–111.

1907. Wölfe, schakale, vorgeschichtliche und neuzeitliche haushunde. Zool. anz., **31**, p. 660–695.

1908. Ueber die abstammung nordrussischer haushunde. Zool. anz., **33**, p. 254–264.

1909. Haustiere der Altai-kalmücken. I. Hunde und katzen. Zool. anz., **34**, p. 683–695.

1910. Ostafrikanische haushunde des Nyassagebietes. Zool. anz., **36**, p. 337–347.

Otto, Hugo.

1909. Beobachtungen an verwilderten hunden. Zool. beobachter (Zool. garten), **50**, p. 176–178.

Oviedo y Valdés, G. F.

1535. Historia general y natural de las Indias, islas y tierra-firme del Mar Océano. (Reprint, Madrid, 4 vols, 4to, 1851–55).

Packard, A. S.

1885. Origin of the American varieties of the dog. Amer. nat., **19**, p. 896–901. Zoologist, 1885, ser. 3, **9**, p. 367–372.

Paris, Paul.

1910. Un cas d'hybridation entre loup et chien. Bull. Soc. zool. France, **35**, p. 58–59.

Pelzeln, August von.

1886. Eine studie über die abstammung der hunderassen. Zool. jahrb., **1**, p. 225–240.

Philippi, R. A.

1886. Ueber die veränderungen welche der mensch in der fauna Chile's bewirkt hat. Festschr. Ver. f. naturk. zu Cassel zur 50-jähr. bestehens, p. 1–20.

Phillips, E. C.

1885. The dog of sacred history. Zoologist, ser. 3, **9**, p. 1–3.

Pictet, F. J.

1853. Traité de paléontologie ou histoire naturelle des animaux fossiles considérés dans leurs rapports zoologiques et géologiques. Paris, ed. 2, 8vo, 4 vols.

Piëtrement, C. A.

1888. L'origine et l'évolution intellectuelle du chien d'arrêt. Bull. Soc. anthrop., ser. 3, **11**, p. 320–365.

Pocock, R. I.

1900. Hybrid dog and fox. Zoologist, ser. 4, **4**, p. 477–478.

Putnam, F. W.

1896. [Remarks on dog-skulls from Ohio]. In Moore, C. B., 1896, p. 26–27.

Rasse, Baron H. de.

1879. Les chiens sauvages et la grande perdrix de La Plata. Bull. Soc. acclimatation Paris, ser. 3, **6**, p. 389–393.

Recchi, N. A., and Lynceus, J. T.

1651. Rerum medicarum Novae Hispaniae thesaurus seu plantarum, animalium, mineralium mexicanorum Historia ex Francisci Hernandez . . . . collecta, etc. Rome, 4to.

Rengger, J. R.

1830. Naturgeschichte der säugethiere von Paraguay. Basel, 8vo.

Richardson, John.

1829. Fauna Boreali-americana; or the zoology of the northern parts of British America. 1, Quadrupeds. London, 4to.

Ross, B. R.

1861. A popular treatise on the fur-bearing animals of the Mackenzie River district. Can. nat. & geol., **6**, p. 5–36.

Ross, J. C.

1835. Account of the objects in the several departments of natural history, seen and discovered during the present expedition. In Ross, John, Appendix to the Narrative of a second voyage in search of a north-west passage, etc. London, 4to, illus.

Rütimeyer, L.

1860. Untersuchung der tierreste aus den pfahlbauten der Schweiz. Mitth. Antiquar. ges. Zürich, **13**, pt. 2.

1862. Die Fauna der pfahlbauten der Schweiz. Neue denkschr. allgem. Schweiz. ges. naturw., **19**, p. 1–248, pl. 1–6.

Saint-Loup, Remy.

1892. Les ancêtres de nos chiens. Le naturaliste, **14**, p. 101–102, 3 text-figs.

Schinz, H. R.

1844. Systematisches verzeichniss aller bis jetzt bekannten säugethiere oder Synopsis Mammalium nach dem Cuvier'schen System. Solothurn, 8vo.

Schmerling, P. C.

1833–4. Recherches sur les ossemens fossiles découverts dans les cavernes de la Province de Liége. Liége, 2 vols., atlas.

Schmitt, F.

1903. Ueber das postembryonale wachstum des schädels verschiedener hunderassen. Arch. naturg., **69**, pt. 1, no. 1, p. 69–134, pl. 4–5, table.

Seler, E.

1890. [The dog in ancient Mexico]. Congr. Américanistes, Berlin, 1888, sess. 7, p. 321–324.

Smith, C. Hamilton.

1840. The naturalist's library. Mammalia. X. Dogs. Edinburgh, 16 mo., illus.

Spegazzini, Carlos.

1882. Costumbres de los habitantes de la Tierra de Fuego. An. Soc. cient. Argentina, **14**, p. 159–181.

[**Stockdale, Arthur**].

1917. The hairless dog. Journ. heredity, **8**, p. 519–520, figs. 21, 22.

Strobel, Pellegrino.

1880. Le razze del cane nelle terramare dell' Emilia. Bull. paleont. Ital., **6**, p. 13–25, 46–53, 110–130, 140–154, 169–179.

Strobel, Pellegrino and Pigorini, Luigi.

1864. Le terremare e la palafitte del Parmense. Seconda relazione. Atti Soc. Ital. sci. nat. Milano, **7**, art. 2, 152 pp., plate.

Studer, Theophil.

1879. Beitrag zur kenntniss der hunderacen in den pfahlbauten. Arch. anthrop., **12**, p. 67–78, pl. 2.

1883. Die thierwelt in den pfahlbauten des Bielersee's. Mitth. Naturf. ges. Bern, for 1882, pt. 2, Abhandlungen, p. 17–115, pl. 1–5.

1884. Nachtrag zu dem aufsatze über die thierwelt in den pfahlbauten des Bielersee's. Mitth. Naturf. ges. Bern, for 1883, pt. 1, Abhandlungen, p. 3–26, pl. 1–6.

1901. Die praehistorischen hunde in ihrer beziehung zu den gegenwärtig lebenden rassen. Abh. Schweiz. paläontol. ges., **28**, no. 1, 137 pp., 9 pls., 18 text-figs.

1904. Ueber den deutschen schäferhund und einige kynologische fragen. Mitth. Naturf. ges. Bern, for 1903, p. 17–55, pl. 1–9.

1905. Étude sur un nouveau chien préhistorique de la Russie. L'anthropologie, **16**, p. 269–285, 2 text-figs.

1906. Ueber einen hund aus der paläolithischen zeit Russlands. *Canis poutiatini.* Zool. anz., **29**, p. 24–35, pl. 1–2.

1908. Schädel eines hundes aus einer prähistorischen wohnstätte der hallstattzeit bei karlstein, amstgericht Reichenhall. Mitth. Naturf. ges. Bern, for 1907, p. 155–168, 2 pls.

Suckley, George, and Gibbs, George.

1860. Report upon the mammals collected on the Survey. Rept. Expl. and surv. railroad from the Mississippi river to the Pacific Ocean, **12**, Washington, 4to.

Teit, James.

1900. The Thompson Indians of British Columbia. Mem. Amer. mus. nat. hist., **2**, p. 163–392, pl. 3.

1909. The Shuswap. Mem. Amer. mus. nat. hist., **4**, p. 443–789, pl. 13–14.

Thorndike, T. W.

1911. The Indian sled dogs of North America. Recreation, February, p. 74–77, 101–102.

Tiemann, Fr.

1865. Meine hündin. Bastard von einem nackten afrikanischen hunde und einer hiesigen wachtelhündin. Zool. garten, **6**, p. 430–434.

Toni, Etorre de.

1897. Sopra un ibrido naturale di *Canis familiaris* e *C. vulpes.* Atti R. ist. Veneto sci. lett. ed arti, ser. 7, **8**, p. 912–916.

Toussaint, H.

1876. Des rapports qui existent, chez le chien, entre le nombre des dents molaires et les dimensions des os de la face. Compt. rend. Acad. sci. Paris, **82**, p. 754–756.

Tozzer, A. M., and **Allen, G. M.**

1910. Animal figures in the Maya codices. Papers Peabody mus., **4**, p. 273–372, pl. 1–39.

Trouessart, E. L.

1911. Le loup de l'Inde (*Canis pallipes* Sykes), souche ancestrale du chien domestique. Compt. rend. Acad. sci. Paris, **152**, p. 909–913, 2 figs.

Tschudi, J. J. von.

1844–6. Untersuchungen über die Fauna Peruana. St. Gallen, 4to, illus.

Vancouver, George.

1798. A voyage of discovery to the North Pacific Ocean, and round the world, etc. London, 4to, 3 vols., illus.

Vieira, L.

1894. Étude comparative du squelette du chien et du loup. Annaes sci. nat., **1**, p. 109–114.

Watson, James.

1909. The dog book. New York, large 8vo, illus.

Warren, Ernest.

1910. On a black, hairless duiker and dog and a bulldog-headed calf. Ann. Natal mus., **2**, p. 235–252, pl. 10–13, 3 text-figs.

White, Taylor.

1890. On the wild dogs of New Zealand. Trans. and proc. New Zealand inst., **22**, p. 327–330.

1892. On the native dog of New Zealand. Trans. and proc. New Zealand inst., **24**, p. 540–557.

Wilckens, Martin.

1885. Uebersicht über die forschungen auf dem gebiete der paläontologie der haustiere. 8. Die hundeartigen tiere (Caniden) des Diluviums. Biol. centralbl., **5**, p. 597–604, 621–627.

1886. Uebersicht über die forschungen auf dem gebiete der paläontologie der haustiere. 9. Die vorgeschichtlichen und die pfahlbau-hunde. Biol. centralbl., **5**, p. 719–729, 751–757.

Windle, B. C. A., and **Humphreys, J.**

1890. On some cranial and dental characters of the domestic dog. Proc. Zool. soc. London, p. 5–29.

Winship, G. P.

1904. The journey of Coronado, 1540–1542, from the City of Mexico to the Grand Cañon of the Colorado and the Buffalo Plains of Texas, Kansas, and Nebraska as told by himself and his followers. Translated and edited with an introduction. New York, 12 mo. illus.

Wissler, Clark.

1917. The American Indian. An introduction to the anthropology of the New World. New York, 8vo, illus.

Woldrich, J. N.

1877. Ueber einen neuen haushund der Bronzezeit (*Canis familiaris intermedius*) aus den aschenlagen von Weikersdorf, Pulkau und Ploscha. Mitth. Anthrop. ges. Wien, **7**, p. 61–85, pl. 1–5.

1879. Ueber Caniden aus dem Diluvium. Denkschr. K. akad. wiss. Wien, math.-nat. cl., **39**, pt. 2, p. 97–148, pl. 1–6.

1882. Beiträge zur geschichte des fossilen hundes, nebst bemerkungen über die lössbildung. Mitth. Anthrop. ges. Wien, **11**, p. 8–17, pl. 1.

1882a. [Die bisherigen resultate der forschung bezüglich des prähistorischen hundes.] Mitth. Anthrop. ges. Wien, **12**, p. 27–31.

1882b. Ueber den haushund von Stradonic. Mitth. Anthrop. ges. Wien, **12**, p. 153–154.

1886. La descendance des races du chien domestique en Europe. L'homme, Journ. illus. sci. anthrop., **3**, p. 65–68.

1886a. Zur frage über die abstammung der europäischen hunderacen. Anz. K. akad. wiss. Wien, math.-nat. cl., **23**, p. 12–16.

1898. Uebersicht der wirbelthierfauna des "Böhmischen Massivs" während der anthropozoischen epoche. Jahrb. K. k. geol. reichsanstalt Wien, **47**, p. 394–428.

Wolfgramm, Albert.

1894. Die einwirkung der gefangenschaft auf die gestaltung des wolfsschädels. Zool. jahrb. Syst., **7**, p. 773–822, pl. 24–26.

Wyman, Jeffries.

1868. An account of some kjoekkenmoeddings, or shell-heaps, in Maine and Massachusetts. Amer. nat., **1**, p. 561–584, pl. 14–15.

Yarrell, William.

1833. [On a specimen of the hairless Egyptian variety of the familiar dog]. Proc. Zool. soc. London, pt. 1, p. 113.

Zacher, G.

1898. Wie wurde der hund zum haustiere? Natur, **47**, p. 397–399.

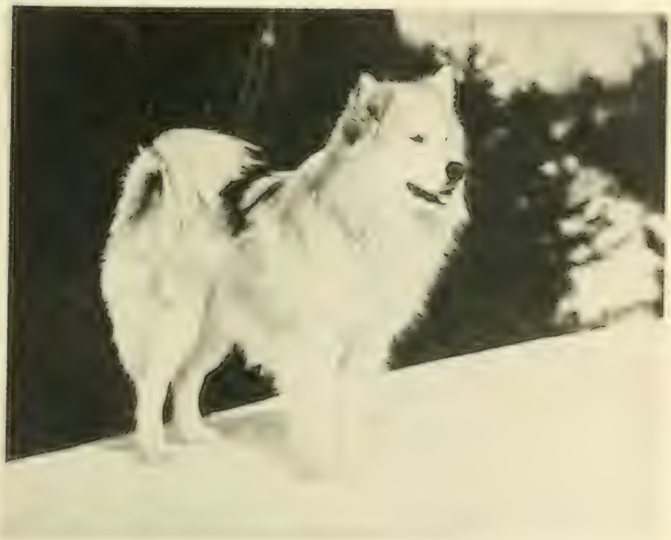
EXPLANATION OF PLATES.

PLATE 1.

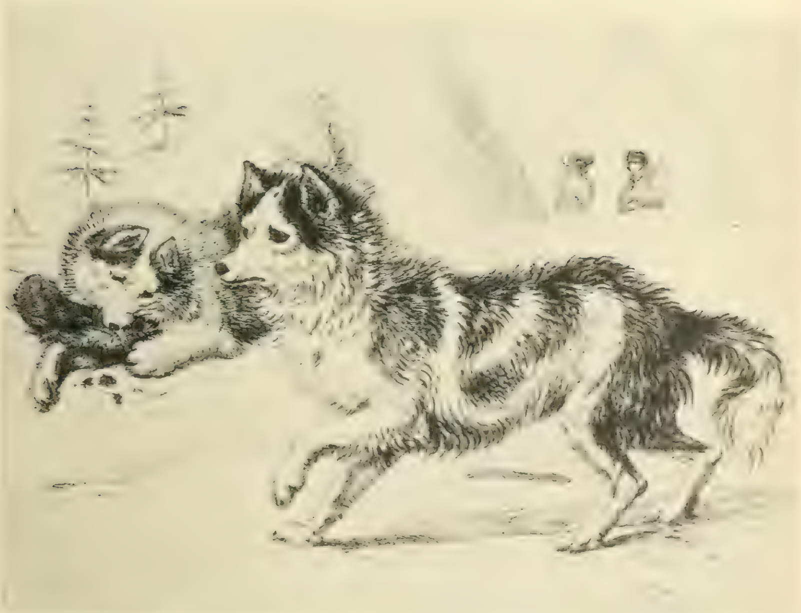
PLATE 1.

Fig. 1.— Eskimo Dog. The grandparents of this dog were brought by Peary from Smith's Sound, Greenland. Photo by Ernest Harold Baynes.

Fig. 2.— The Hare-Indian Dog of northern Mackenzie. From Richardson's plate (1829).



1



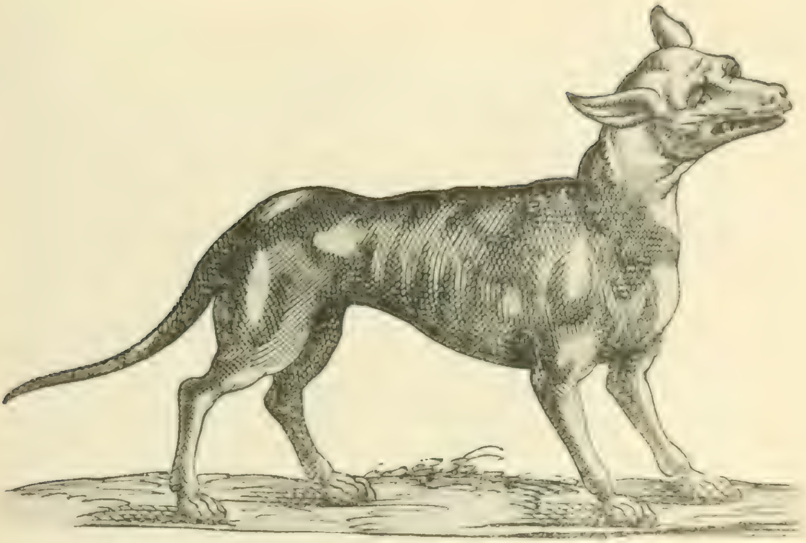
2

PLATE 2.

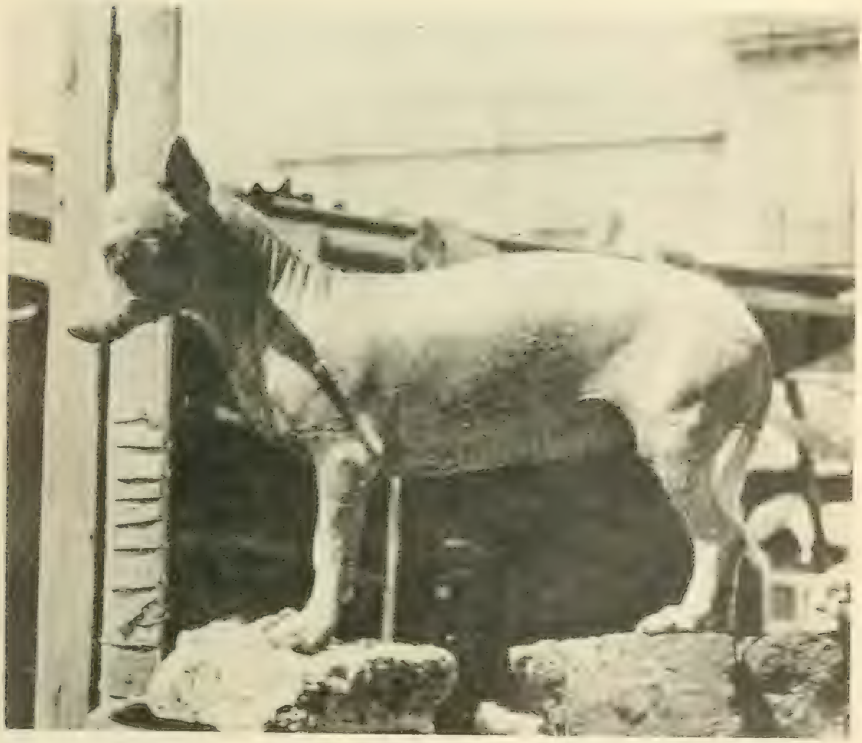
PLATE 2.

Fig. 1.— Mexican Hairless Dog. Reproduction of figure of *Lupus mexicanus* from Recchi and Lynceus (1651).

Fig. 2.— Mexican Hairless Dog, ♀. Photograph by Arthur Stockdale of Mexico City. Courtesy of The Journal of Heredity.



1



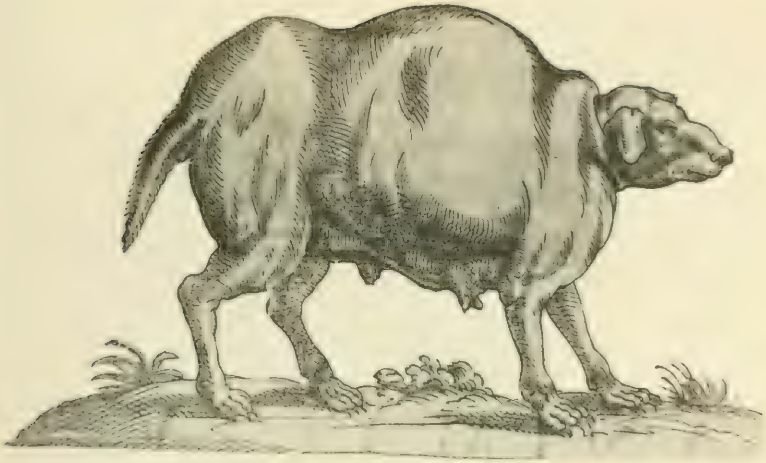
2

PLATE 3.

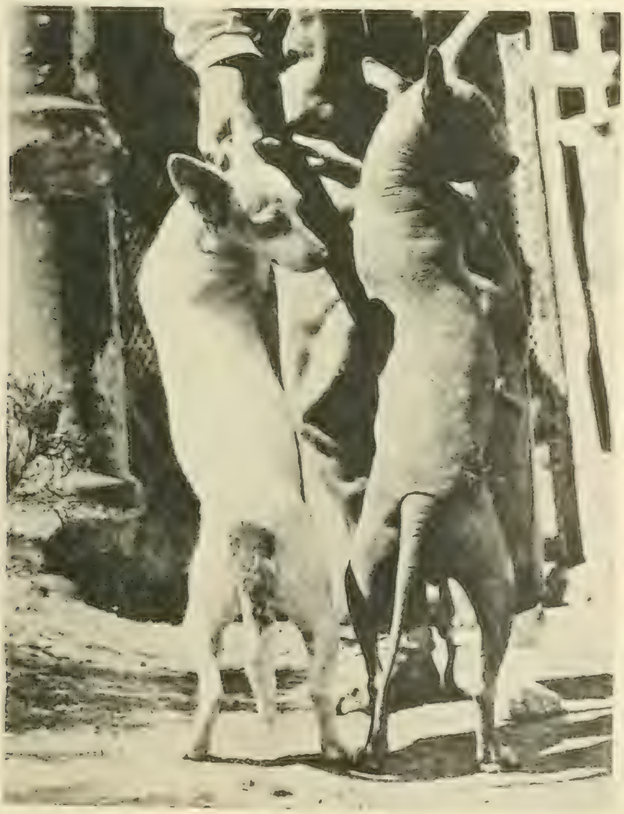
PLATE 3.

Fig. 1.— The Ytzcuinteporzotli or *Canis mexicana* of Hernandez, reproduced from the figure by Recchi and Lynceus (1651) . It probably represents a Raccoon.

Fig 2.— On the right a Mexican Hairless Dog, on the left a hairy dog from the same litter. The parents of these two were a Mexican Hairless Dog shown in Plate **2**, fig. 2, and a mongrel dog, normally haired. Courtesy of the Journal of Heredity.



1



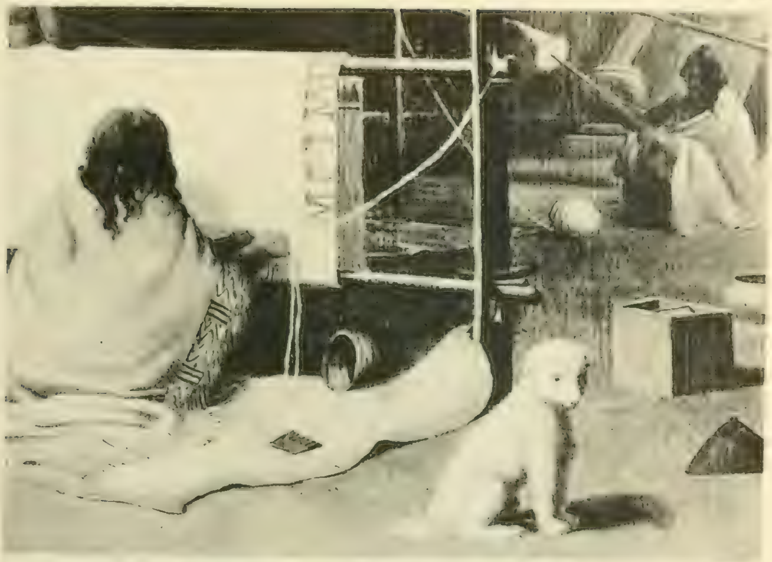
2

PLATE 4.

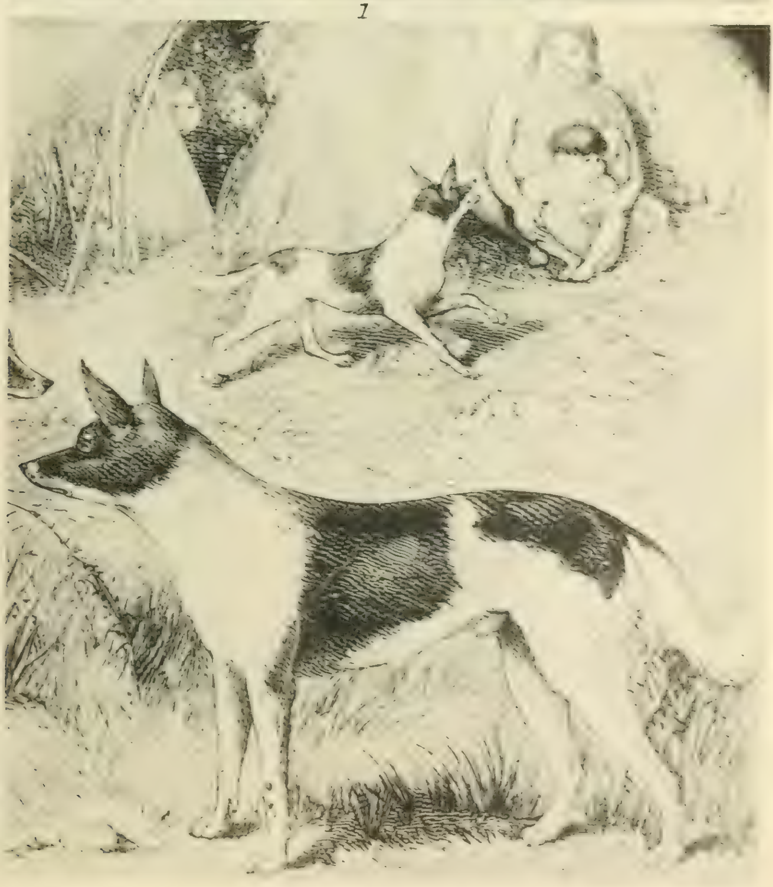
PLATE 4.

Fig. 1.— Clallam-Indian Dog. From the painting by Paul Kane in 1846, now in the Royal Ontario Museum of Archaeology at Toronto.

Fig. 2.— Fuegian Dog. Reproduction of d'Herculais' (1884) figure drawn from a dog brought to France from Tierra del Fuego by the Mission Scientifique du Cap Horn.



1



2

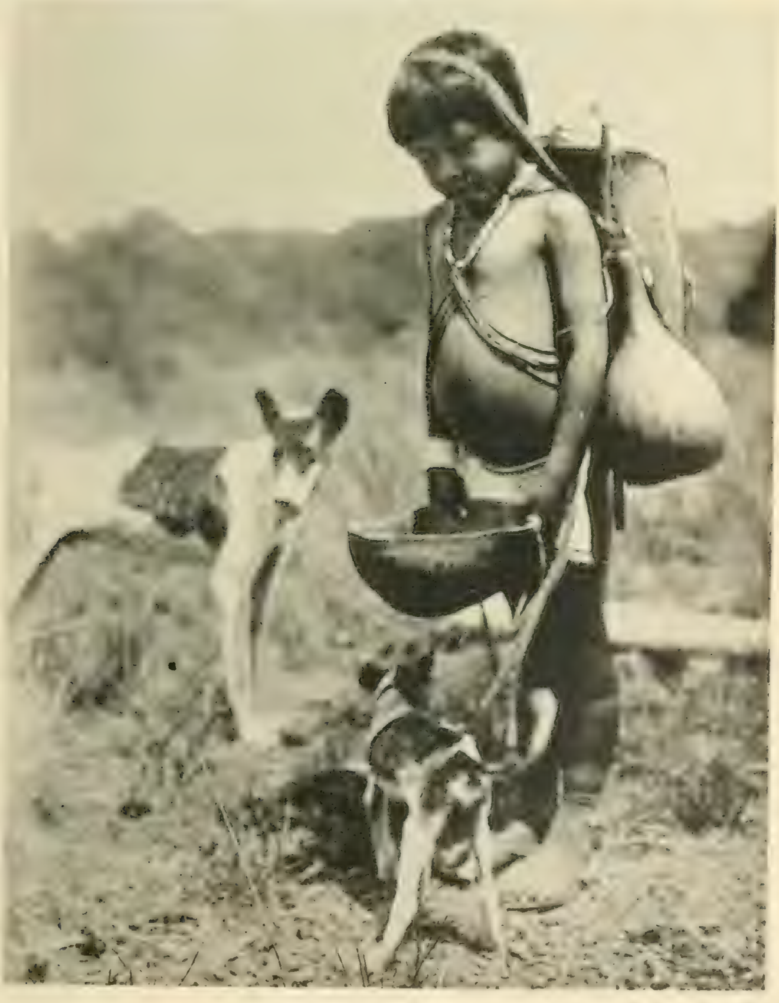
PLATE 5.

PLATE 5.

Fig. 1.— A dog of the Bersimis Indians, Canada, supposed to represent the Short-legged Indian Dog. Photograph by William B. Cabot.

Fig. 2.— Small yellow-and-white or brindle dogs, with a child of the Macusi Indians in southern British Guiana. These dogs may have more or less blood of European stock, but probably retain some aboriginal characteristics. Photograph by Dr. William C. Farrabee.

1



2

PLATE 6.

PLATE 6.

The Short-nosed Indian Dog ("Pachycyon"). A mummified specimen collected by Messrs. S. J. Guernsey and A. V. Kidder in the Marsh Pass region, Arizona, and now in the Peabody Museum of Archaeology. Photograph by S. J. Guernsey.

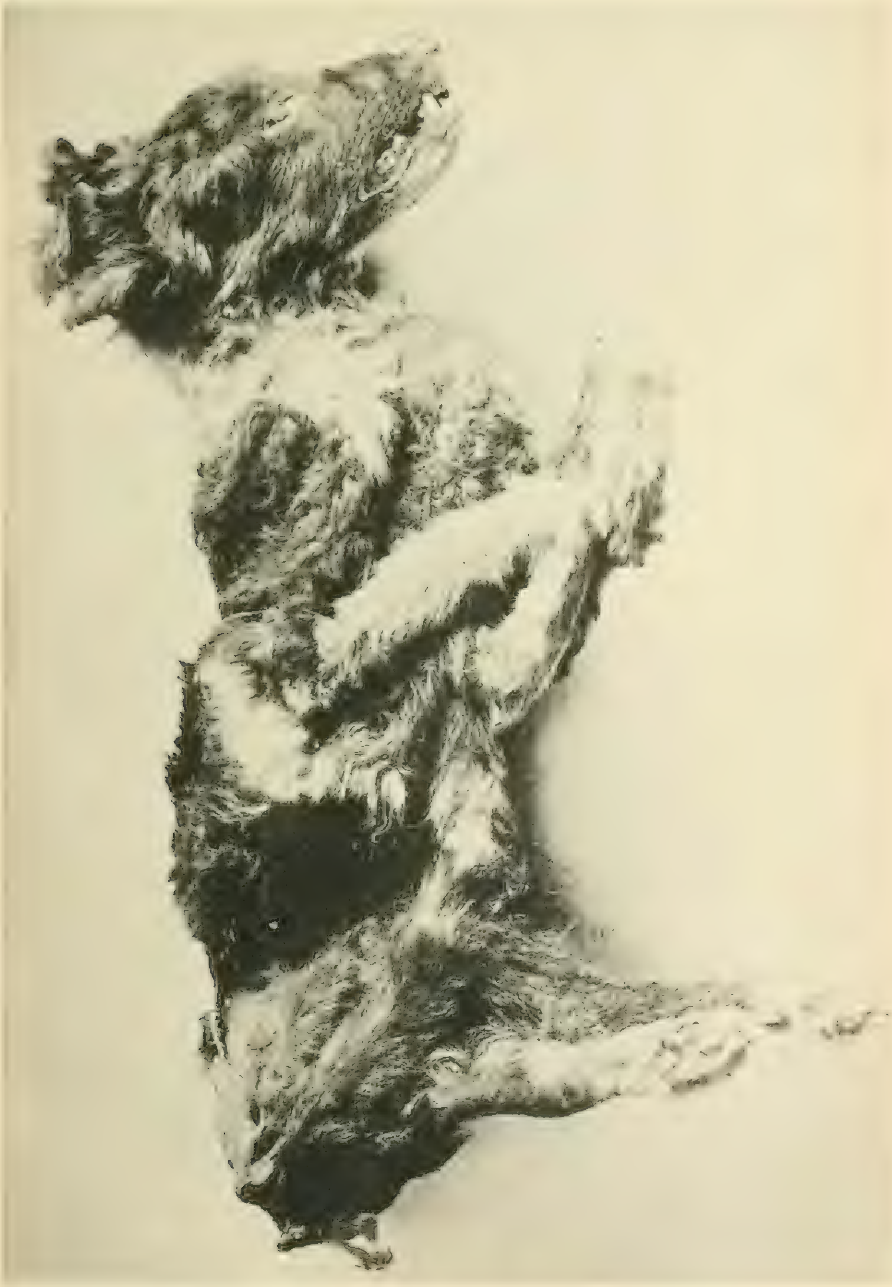


PLATE 7.

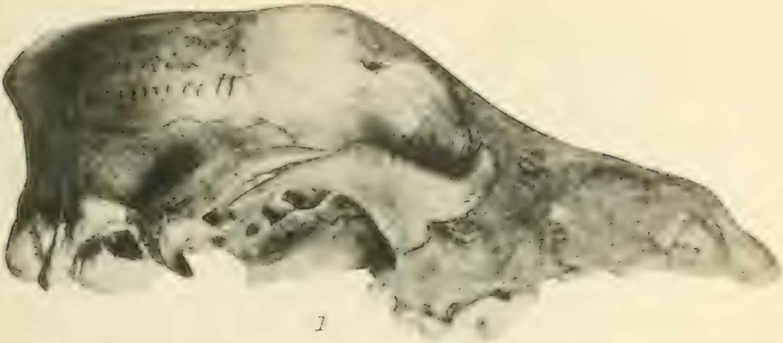
PLATE 7.

Skull of the Common Indian Dog, collected by Kennicott on Peel River, northern Mackenzie, U. S. N. M. 6,219. Length 177 mm.

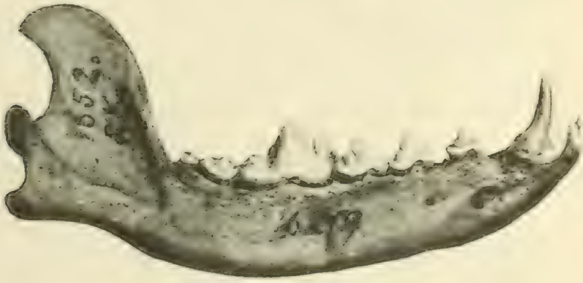
Fig. 1.— Cranium in profile showing relatively weak crests and slender muzzle.

Fig. 2.— Lower ramus; the first premolar normally lacking.

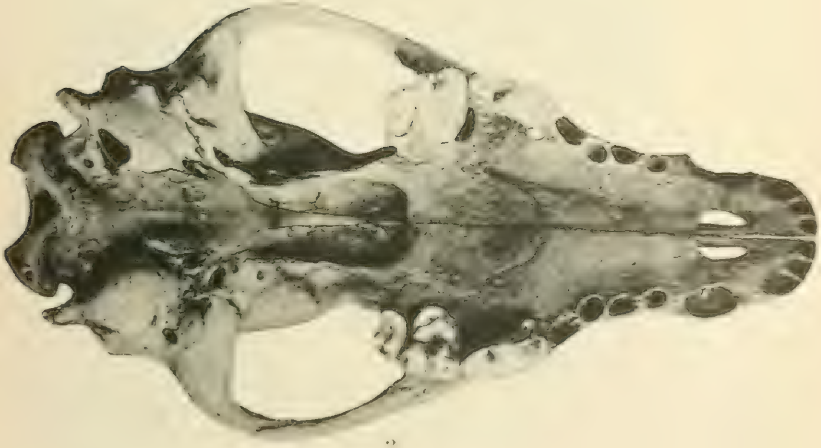
Fig. 3.— Cranium, ventral view; upper first premolar lacking.



1



2



3

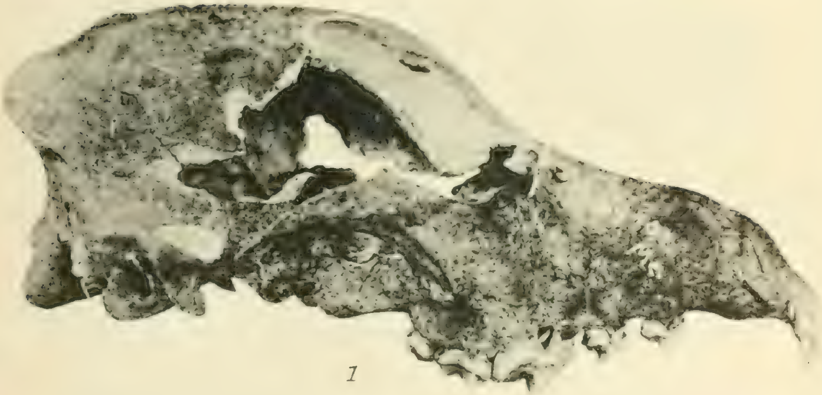
PLATE 8.

PLATE 8.

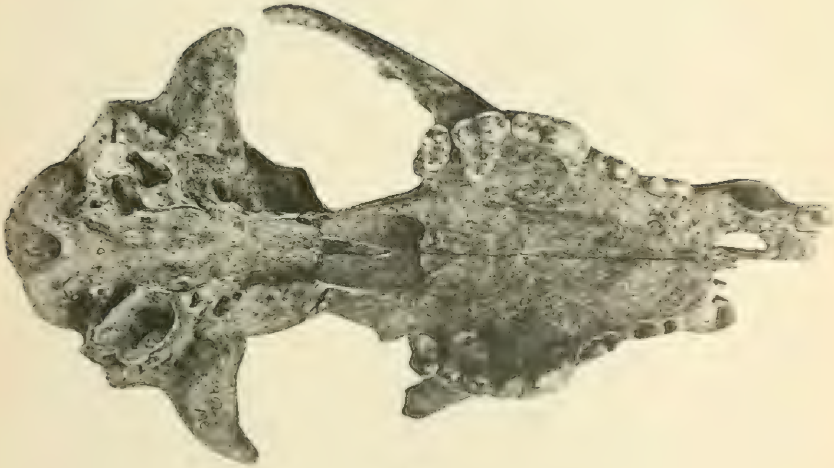
Cranium of the Common Indian Dog from Le Moine shell-heap, Frenchman's Bay, Maine, collection of Phillips Academy, Andover, Mass., 53,902 Me. Length 192 mm.

Fig. 1.— Profile view.

Fig. 2.— Ventral view. The first upper premolar is lacking.



1



2

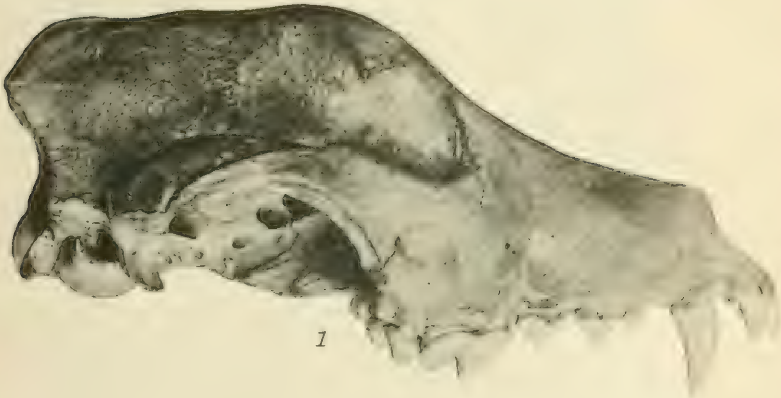
PLATE 9.

PLATE 9.

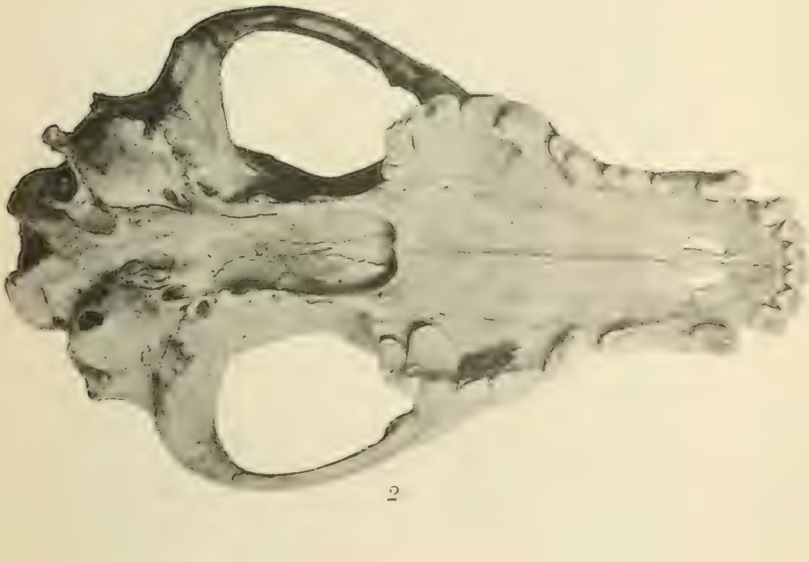
Cranium of an Inca Dog, collected by Dr. A. Hrdlička at Huacho, Peru, U. S. N. M. 176,309. Length, occiput to anterior root of incisors, 178 mm.

Fig. 1.— Profile.

Fig. 2.— Ventral view. The first premolar is present on the left side only.



1



2

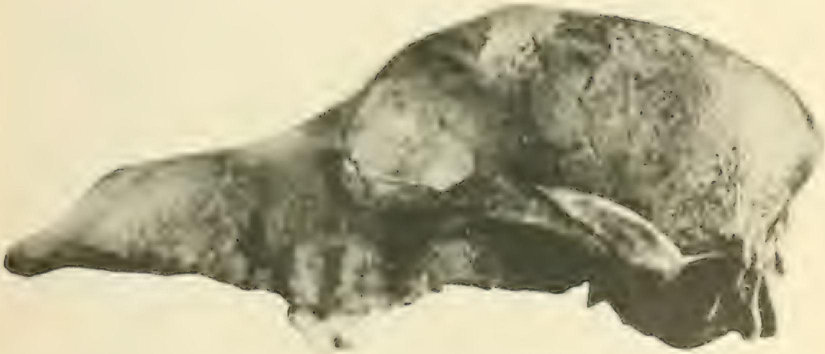
PLATE 10.

PLATE 10.

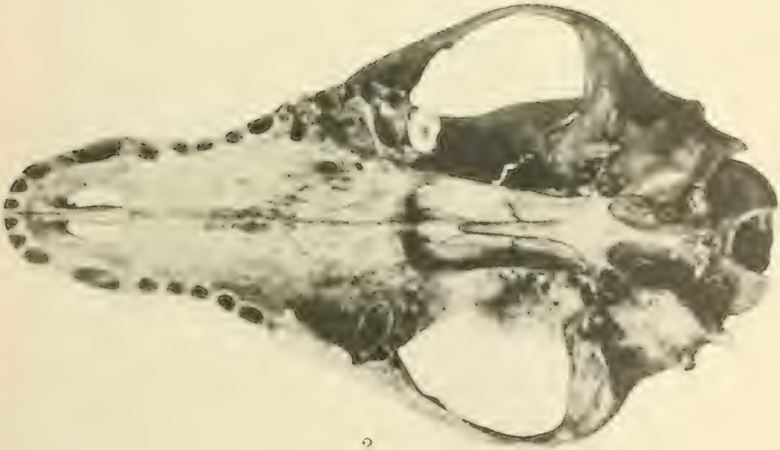
Small Indian Dog or Techichi, from a cranium collected by L. F. Carr, in Ely Cave, Lee County, Virginia, M. C. Z. 7,123. Length, occiput to tip of premaxillaries, 140 mm.

Fig. 1.— Profile.

Fig. 2.— Ventral view.



1



2

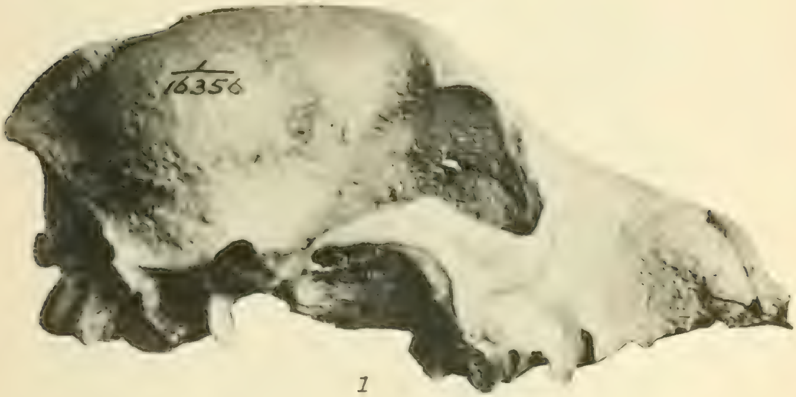
PLATE 11.

PLATE 11.

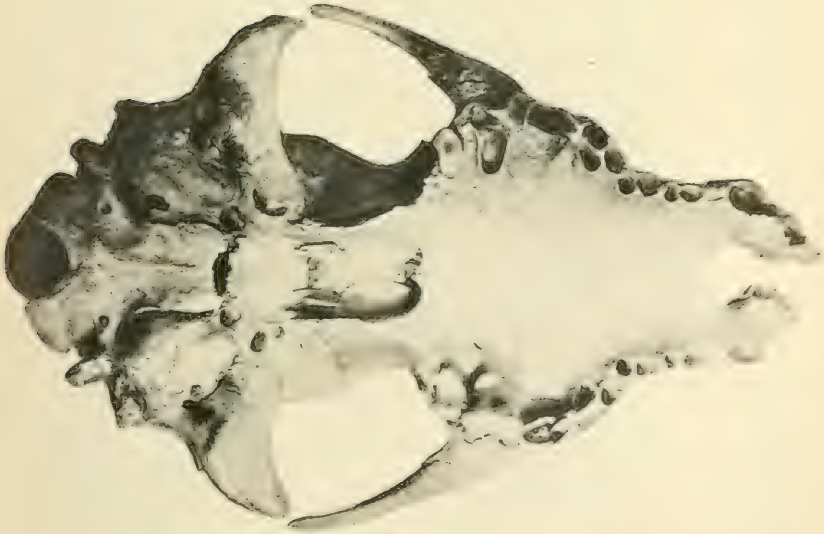
Cranium of a Short-nosed Indian Dog (" Pachycyon ") from shell-mound on San Nicolas Island, off southern California, Univ. of Cal., Anthrop. Mus., $\frac{1}{16356}$. Length, occiput to tip of premaxillary, 138 mm.

Fig. 1.— Profile.

Fig. 2.— Ventral view.



1



2

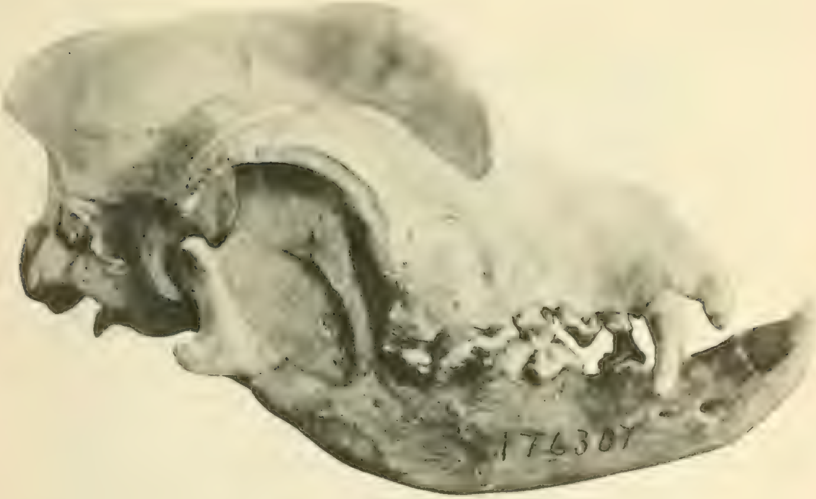
PLATE 12.

PLATE 12.

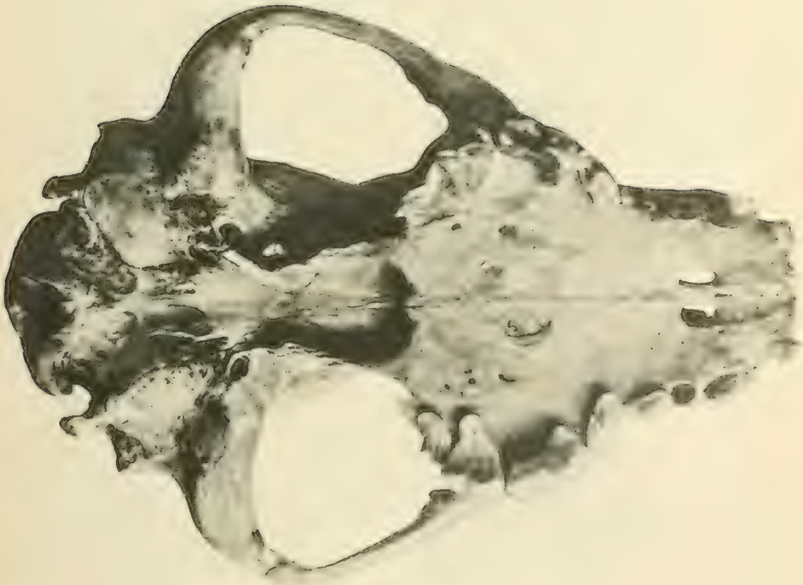
Skull of the Peruvian Pug-nosed Dog, collected by Dr. A. Hrdlička at Huacho, Peru, U. S. N. M. 176,307. Length of cranium, occiput to tip of premaxillaries, 147 mm.

Fig. 1.— Profile, showing undershot jaw.

Fig. 2.— Cranium, ventral view.



1



2

HELIOTYPE CO. BOSTON

QL
1
H3
v.63
Biological
& Medical
Serials

Harvard University. Museum
of Comparative Zoology
Bulletin

PLEASE DO NOT REMOVE
CARDS OR SLIPS FROM THIS POCKET

UNIVERSITY OF TORONTO LIBRARY

STORAGE